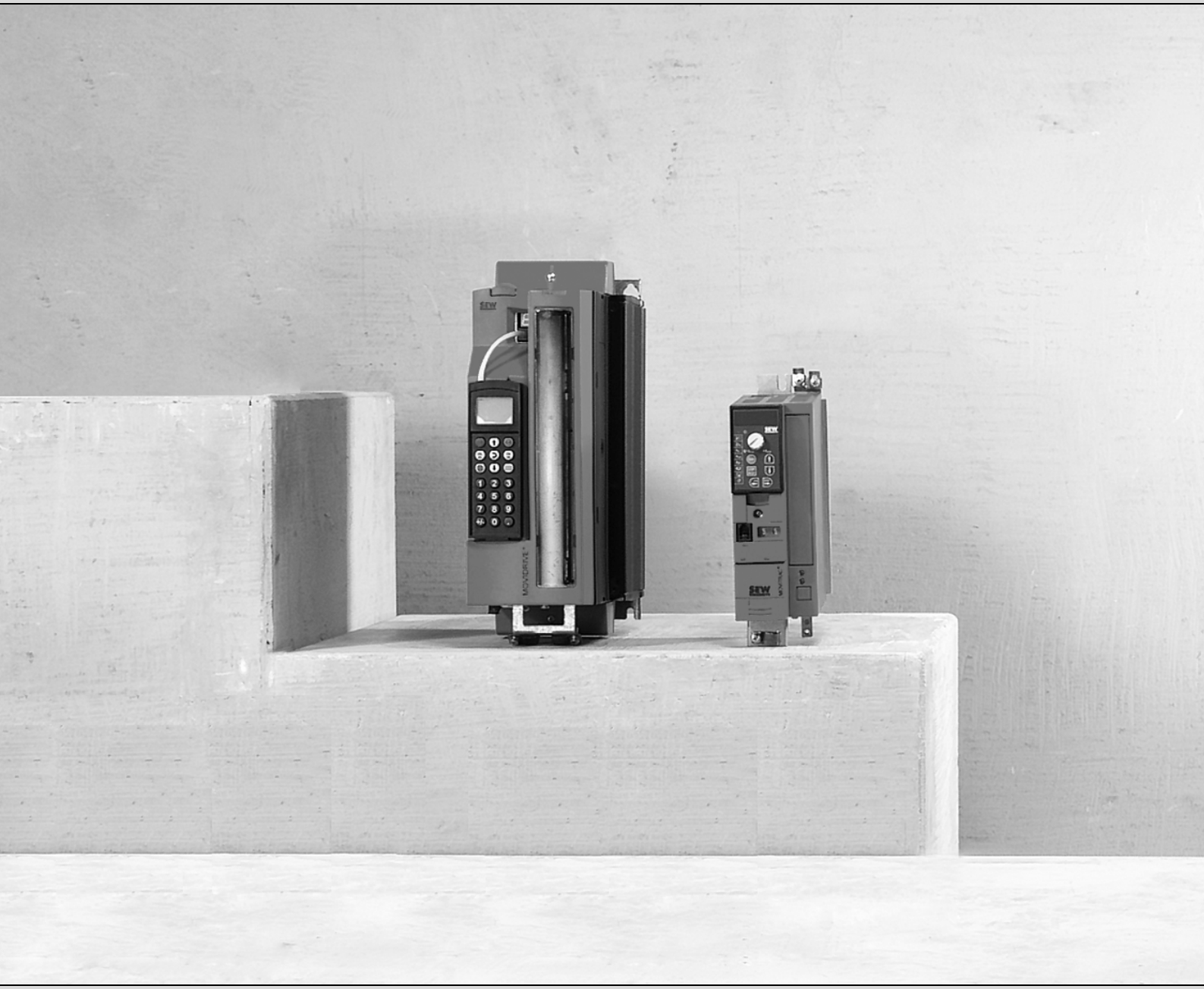
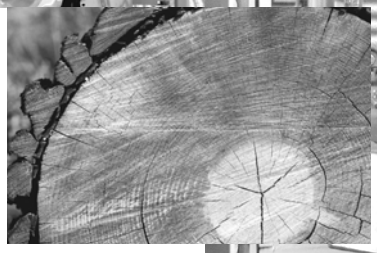
SEW EURODRIVE



DFD11B DeviceNet Fieldbus Interface

Edition 10/2007
11637013 / EN

Manual



SEW EURODRIVE

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1 General Notes

1.1 Structure of the safety notes

The safety notes in this manual are designed as follows:

Symbol	SIGNAL WORD
	Nature and source of hazard. Possible consequence(s) if disregarded. • Measure(s) to avoid the hazard.

Symbol	Signal word	Meaning	Consequences if disregarded
Example: General hazard Specific hazard, e.g. electric shock	**HAZARD**	Imminent hazard	Severe or fatal injuries
	WARNING	Possible hazardous situation	Severe or fatal injuries
	CAUTION	Possible hazardous situation	Minor injuries
	STOP!	Possible damage to property	Damage to the drive system or its environment
	NOTE	Useful information or tip Simplifies drive system handling	

1.2 Right to claim under warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation. Therefore, read the manual before you start operating the device!

Make sure that the manual is available to persons responsible for the plant and its operation, as well as to person who work independently on the device. You must also ensure that the documentation is legible.

1.3 Exclusion of liability

You must comply with the information contained in the MOVIDRIVE® / MOVITRAC® documentation to ensure safe operation and to achieve the specified product characteristics and performance requirements. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.

2 Safety Notes

2.1 Other applicable documentation

- Installation and startup only by trained personnel observing the relevant accident prevention regulations and the following documents:
  - "MOVIDRIVE® MDX60B / 61B operating instructions
  - "MOVITRAC® B" operating instructions
- Read through this manual carefully before you commence installation and startup of the DFD11B option.
- As a prerequisite to fault-free operation and fulfillment of warranty claims, you must adhere to the information in the documentation.

2.2 General safety notes for bus systems

This communication system allows you to match the MOVIDRIVE® drive inverter to the specifics of your application. As with all bus systems, there is a danger of invisible, external (as far as the inverter is concerned) modifications to the parameters which give rise to changes in the unit behavior. This may result in unexpected (not uncontrolled) system behavior.

2.3 Safety functions

The MOVIDRIVE® MDX60B/61B and MOVITRAC® B drive inverters may not perform safety functions without higher-level safety systems. Use higher-level safety systems to ensure protection of equipment and personnel. For safety applications, ensure that the information in the following publications is observed: "Safe Disconnection for MOVIDRIVE® MDX60B/61B / MOVITRAC® B".

2.4 Hoist applications

MOVIDRIVE® MDX60B/61B and the MOVITRAC® B are not designed for use as a safety device in hoist applications..

Use monitoring systems or mechanical protection devices as safety equipment to avoid possible damage to property or injury to people.

2.5 Product names and trademarks

The brands and product names in this manual are trademarks or registered trademarks of the titleholders.

2.6 Disposal

Please follow the current national regulations.

Dispose of the following materials separately in accordance with the country-specific regulations in force, as:

- Electronics scrap
- Plastics
- Sheet metal
- Copper

3 Introduction

3.1 Content of this manual

This user manual describes

- Installing the DHP11B option card in the MOVIDRIVE® MDX61B drive inverter.
- Using the DFD11B option card in the MOVITRAC® B frequency inverter and in the UOH11B gateway housing
- Starting up the MOVIDRIVE® MDX61B with the DeviceNet fieldbus system.
- Starting up the MOVITRAC® B with the DeviceNet gateway.
- Configuring the DeviceNet master with EDS files.

3.2 Additional documentation

For information on how to connect MOVIDRIVE® straightforwardly and effectively to the DeviceNet fieldbus system, in addition to this user manual about the DeviceNet option, you should request the following publications about fieldbus technology:

- MOVIDRIVE® Fieldbus Unit Profile manual
- MOVITRAC® B and MOVIDRIVE® MDX60B/61B system manual

Apart from the description of the fieldbus parameters and their coding, the MOVIDRIVE® Fieldbus Unit Profile manual" and the MOVITRAC® B and MOVIDRIVE® MDX60B/61B system manual, provide information on various control concepts and application options in the form of brief examples.

The 'MOVIDRIVE® Fieldbus Unit Profile' manual provides a list of all parameters of the drive inverter that can be read and written via the several communication interfaces such as System bus, RS485 and via the fieldbus interface.

3.3 Features

With the DFD11B option and its powerful universal fieldbus interface, the MOVIDRIVE® MDX61B drive inverter and the MOVITRAC® B frequency inverter allow for a connection to higher-level automation systems via DeviceNet.

3.3.1 MOVIDRIVE®, MOVITRAC® B and DeviceNet

The unit behavior of the inverter that forms the basis of DeviceNet operation is referred to as the unit profile. It is independent of any particular fieldbus and is therefore a uniform feature. This feature allows the user to develop fieldbus-independent drive applications. This makes it much easier to change to other bus systems, such as EtherNet/IP (Option DF33B).

3.3.2 Data exchange via Polled I/O and bit-strobe I/O

SEW drives offer digital access to all drive parameters and functions via the DeviceNet interface. The inverter is controlled via fast, cyclic process data. Via this process data channel, you can enter setpoints such as the setpoint speed, ramp generator time for acceleration / deceleration, etc. as well as trigger various drive functions such as enable, control inhibit, normal stop, rapid stop, etc. At the same time you can also use this channel to read back actual values from the inverter, such as actual speed, current, unit status, error number or reference signals.

3.3.3 Parameter access via explicit messages

The parameters of the inverter are set exclusively using *explicit messages*. This parameter data exchange enables you to implement applications in which all the important drive parameters are stored in the master programmable controller, so that there is no need to make manual parameter settings on the drive inverter itself.

3.3.4 Monitoring functions

Using a fieldbus system requires additional monitoring functions for the drive technology, for example, time monitoring of the fieldbus (fieldbus timeout) or rapid stop concepts. You can, for example, adjust the monitoring functions of MOVIDRIVE® / MOVITRAC/® specifically to your application. You can determine, for instance, which of the drive inverter's error responses should be triggered in the event of a bus error. For many applications, a rapid stop function is be useful. However you can also freeze the last setpoints so that the drive continues to operate with the most recently valid setpoints (e.g., conveyor belt). As the range of functions for the control terminals is also guaranteed in fieldbus mode, you can continue to implement rapid stop concepts using the terminals of the drive inverter, irrespective of the fieldbus used.®

3.3.5 Diagnostics

The MOVIDRIVE®drive inverter and the MOVITRAC® B frequency inverter offer you numerous diagnostics options for startup and service. You can, for instance, use the fieldbus monitor integrated in MOVITOOLS® MotionStudio to control setpoint values sent from the higher-level controller as well as the actual values.

3.3.6 Fieldbus monitor

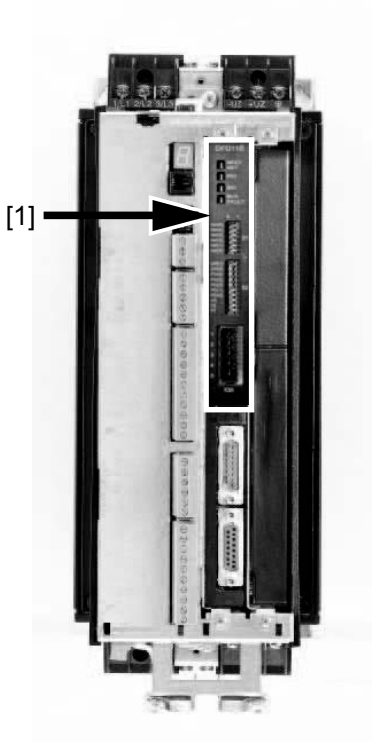
Furthermore, you are supplied with a variety of additional information about the status of the fieldbus interface. The fieldbus monitor function in conjunction with the MOVITOOLS® MotionStudio PC software offers you an easy-to-use diagnostic tool for setting all drive parameters (including the fieldbus parameters) and for displaying the fieldbus and device status information in detail.

4 Assembly and Installation

This section contains information about assembly and installation of the DFD11B option card in MOVIDRIVE® MDX61B, MOVITRAC® B and UOH11B gateway housing.

4.1 Installing the DFD11B option card in MOVIDRIVE® MDX61B

	NOTES
	Only SEW-EURODRIVE personnel may install or remove option cards for MOVIDRIVE® MDX61B size 0. • Users may only install or remove option cards for MOVIDRIVE® MDX61B sizes 1 to 6. • The DFD11B option card must be plugged into fieldbus slot [1]. • The DFD11B option is powered via MOVIDRIVE® B. A separate voltage supply is not required.



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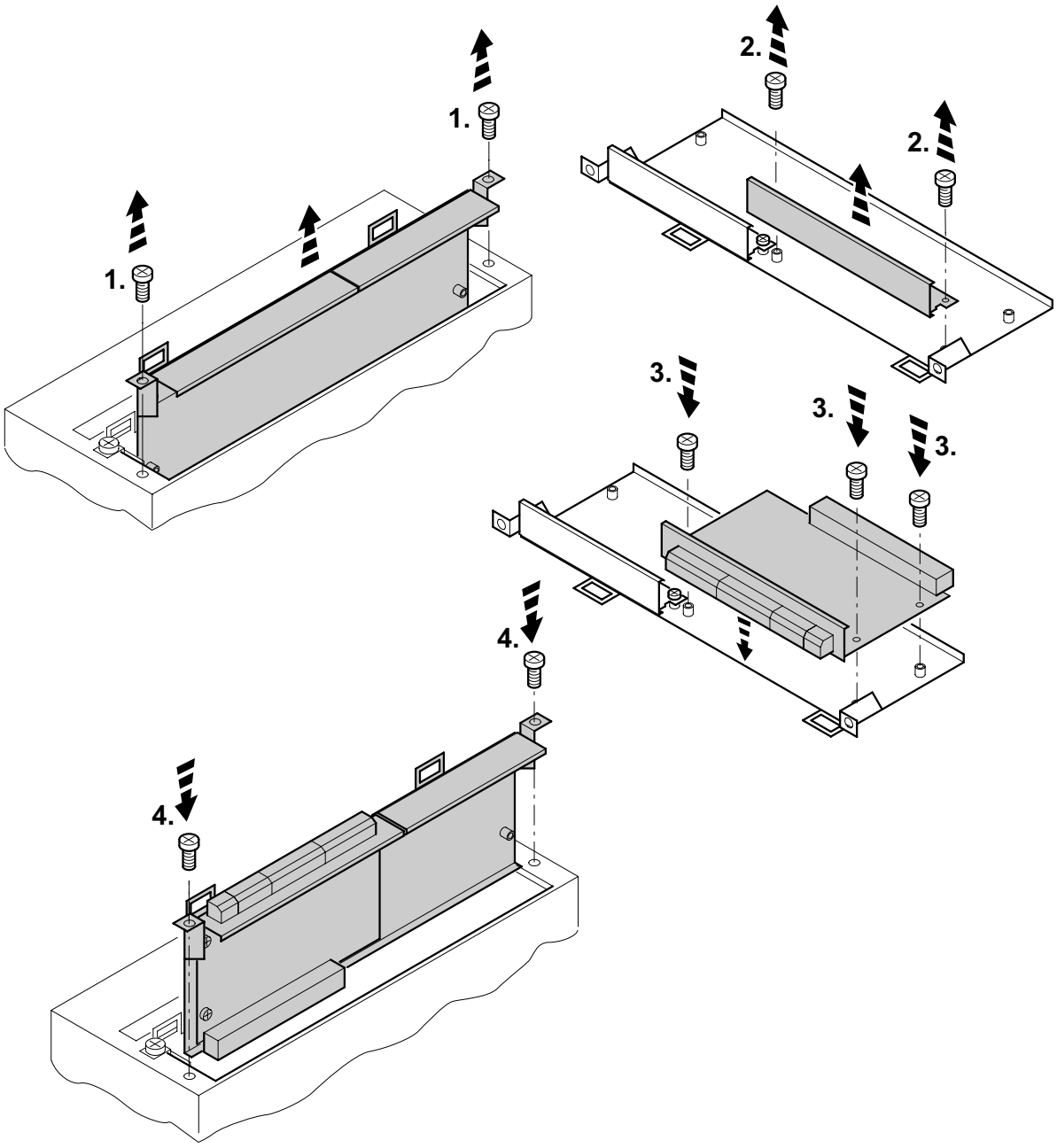
4.1.1 Before you begin

Read the following notes before installing or removing an option card:

- Disconnect the inverter from the power. Switch off the 24 V DC and the supply voltage.
- Take appropriate measures to protect the option card from electrostatic charge (use discharge strap, conductive shoes, and so on) before touching it.
- **Before installing** the option card, remove the keypad and the front cover (→ operating instructions MOVIDRIVE® MDX60B/61B, section 'Installation').
- **After installing** the option card, replace the keypad and the front cover (→ operating instructions MOVIDRIVE® MDX60B/61B, section 'Installation').
- Keep the option card in its original packaging until immediately before you are ready to install it.
- Hold the option card by its edges only. Do not touch any components.

4.1.2 Basic procedure for installing and removing an option card (MDX61B, BG 1 - 6)



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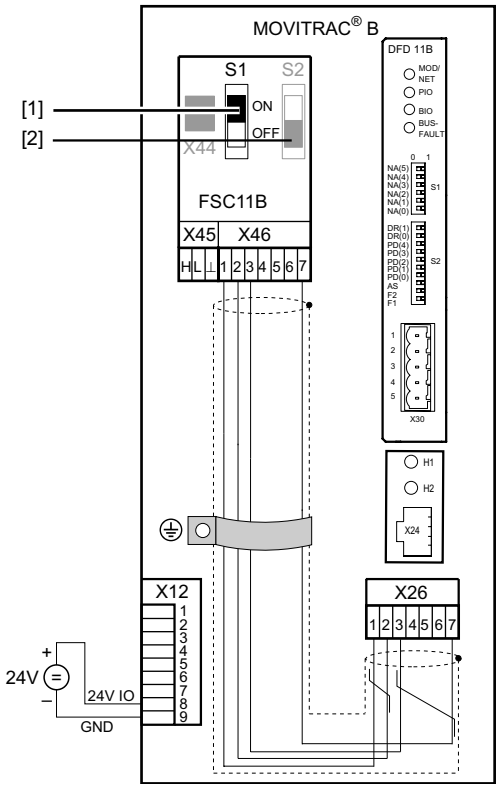
1. Remove the two retaining screws holding the card retaining bracket. Pull the card retaining bracket out evenly from the slot (do not twist!).
2. Remove the two retaining screws of the black cover plate on the card retaining bracket. Remove the black cover plate.
3. Position the option card onto the retaining bracket so that the three retaining screws fit into the corresponding bores on the card retaining bracket.
4. Insert the retaining bracket with installed option card into the slot, pressing slightly so it is seated properly. Secure the card retaining bracket with the two retaining screws.
5. To remove the option card, follow the instructions in reverse order.

4.2 Installing the DFD11B option card in MOVITRAC® B

	NOTE
	Only SEW-EURODRIVE engineers may install or remove option cards for MOVITRAC® B.

4.2.1 System bus connection between a MOVITRAC® B and the DFD11B option



[1] Terminating resistor activated, S1 = ON

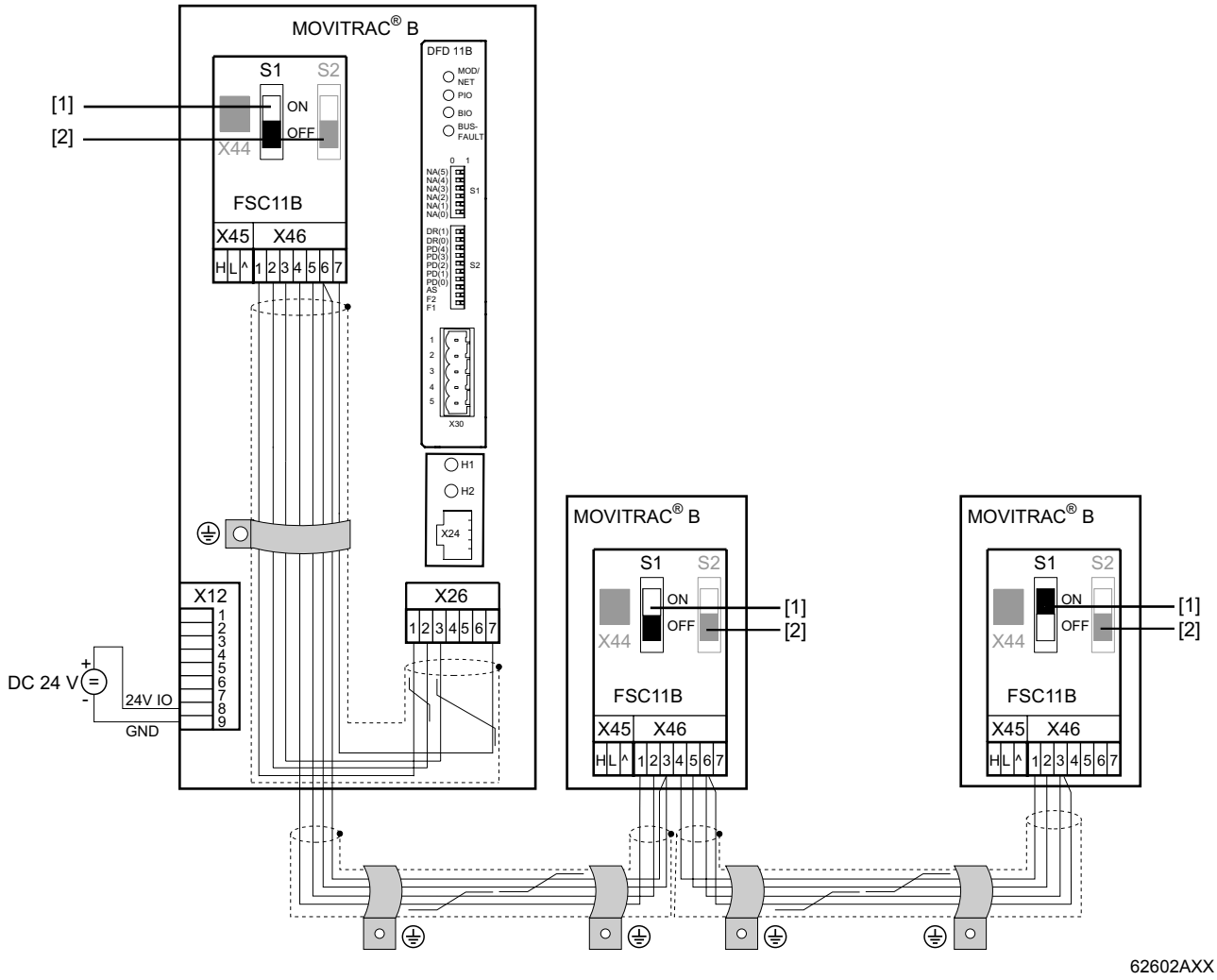
[2] DIP switch S2 (reserved), S2 = OFF

X46	X26	Terminal assignment
X46:1	X26:1	SC11 SBus +, CAN high
X46:2	X26:2	SC12 SBus –, CAN low
X46:3	X26:3	GND, CAN GND
	X26:4	Reserved
	X26:5	Reserved
X46:6	X26:6	GND, CAN GND
X46:7	X26:7	DC 24 V

X12	Terminal assignment
X12:8	DC 24 V input
X12:9	GND reference potential for the binary inputs

To simplify cabling, the DFD11B can be supplied with DC 24 V from X46.7 of the MOVITRAC® to X26.7. MOVITRAC® B must be supplied with DC 24 V at terminals X12.8 and X12.9 when it supplies the DFD11B option. Activate the system bus terminating resistor at the FSC11B option (S1 = ON).

4.2.2 System bus connection between multiple MOVITRAC® B units



[1] **only** the terminating resistor at the last unit is activated, S1 = ON

[2] DIP switch S2 (reserved), S2 = OFF

MOVITRAC® B		**DFD11B via UOH11B gateway housing**	
X46	**Terminal assignment**	**X26**	**Terminal assignment**
X46:1	SC11 (System bus incoming, high)	X26:1	SC11 SBus +, CAN High
X46:2	SC12 (System bus incoming, low)	X26:2	SC12 SBus –, CAN Low
X46:3	GND (System bus reference)	X26:3	GND, CAN GND
X46:4	SC21 (System bus outgoing, high)	X26:4	Reserved
X46:5	SC22 (System bus outgoing, low)	X26:5	Reserved
X46:6	GND (System bus reference)	X26:6	GND, CAN GND
X46:7	DC 24 V	X26:7	DC 24 V
X12	**Terminal assignment**		
X12:8	DC 24 V		
X12:9	GND (reference potential for the binary inputs)		

Please note:

- If possible, use a 2x2 core twisted and shielded copper cable (data transmission cable with braided copper shield). Connect the shield on both sides to the electronics shield clamp of the MOVITRAC® B over a large area. Additionally for a 2-core cable, connect the shield ends to the GND. The cable must meet the following specifications:
  - Cable cross section 0.25 mm^2 (AWG23) ... 0,75 mm^2 (AWG18)
  - Line resistance 120 W at 1 MHz
  - Capacitance per unit length $\leq$ 40 pF/m at 1 kHz

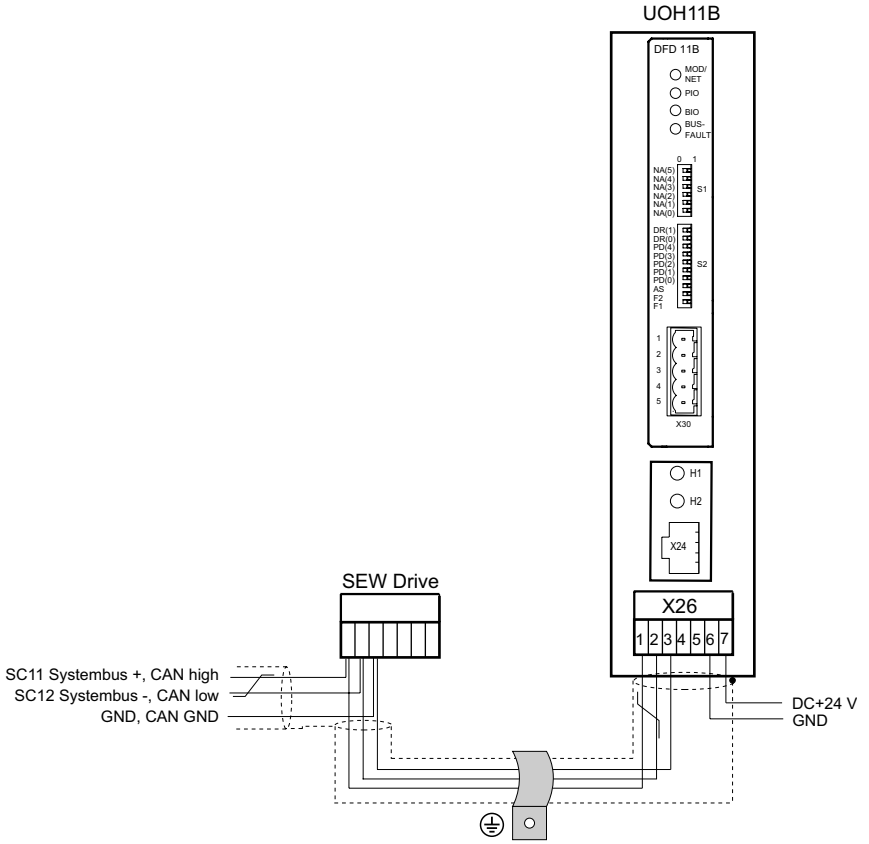
  Suitable cables are e.g. CAN bus or DeviceNet cables.
- The permitted total cable length depends on the baud rate setting of the SBus:
  - 250 kBaud: 160 m
  - 500 kBaud: 80 m
  - 1000 kBaud: 40 m
- Connect the system bus terminating resistor (S1 = ON) at the end of the system bus connection. Switch off the terminating resistor on the other units (S1 = OFF). The DFD11B gateway must always be connected either at the beginning or the end of the system bus connection and features a permanently installed terminating resistor.
- Point-to-point wiring is not permitted.

	NOTE
	• There must not be any potential displacement between the units connected with the SBus. Take suitable measures to avoid a potential displacement, e.g. by connecting the unit ground connectors using a separate lead.

4.3 Installing the DFE11B / UOH11B gateway

The following figure shows the connection of the DFD11B option via the UOH11B:X26 gateway housing.

	NOTE
	Only SEW-EURODRIVE engineers are allowed to install or remove option cards in/from the UOH11B gateway housing.



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UOH11B gateway housing	
X26	**Terminal assignment**
X26:1	SC11 system bus +, CAN high
X26:2	SC12 system bus -, CAN low
X26:3	GND, CAN GND
X26:4	Reserved
X26:5	Reserved
X26:6	GND, CAN GND
X26:7	DC 24 V

The gateway housing has a power supply of DC 24 V that is connected to X26.

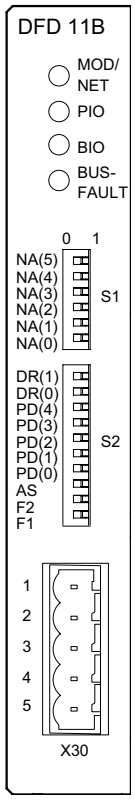
Connect the system bus terminating resistor at the end of the system bus connection.

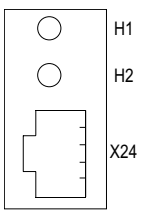
4.4 Connection and terminal description DFD11B option

Part number DeviceNet fieldbus interface type DFD11B: 824 972 5

NOTES

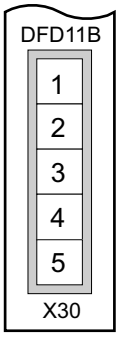
- The DeviceNet fieldbus interface DFD11B option is only possible in conjunction with MOVIDRIVE® MDX61B, not with MDX60B.
- Plug the DFD11B option into the fieldbus slot.

Front view of DFD11B	Description	DIP switch Terminal	Function
 62008AXX	**MOD/NET = module/network status** **PIO - Polled I/O** **BIO - Bit-Strobe I/O** **BUS FAULT**		The two-color LEDs display the current status of the fieldbus interface and the DeviceNet system:
	Six DIP switches for setting the MAC-ID	**NA(0) ... NA(5)**	Setting the MAC-ID (Media Access Control Indentifier)
	Two DIP switches for setting the baud rate	**DR(0) ... DR(1)**	Setting the DeviceNet baud rate: DR0 = "0"/ DR1 = "0" → 125 kBaud DR0 = "1"/ DR1 = "0" → 250 kBaud DR0 = "0"/ DR1 = "1" → 500 kBaud DR0 = "1"/ DR1 = "1" → invalid
	Five DIP switches for setting the process data length	**PD(0) ... PD(4)**	Setting the process data length (1 ... 24 words) in MOVITRAC® B Setting the process data length (1 ... 10 words) in MOVIDRIVE® B
		AS	Auto setup for gateway operation
		F1, F2	No function
	X30: DeviceNet connection	**X30:1**	V–
		X30:2	CAN_L
		X30:3	DRAIN
		X30:4	CAN_H
		X30:5	V+

Front view of MOVITRAC® B and UOH11B	Description	Function
 58129AXX	**LED H1 (red)**	System bus error (only for gateway functions)
	LED H2 (green)	Reserved
	X24 X terminal	RS-485 interface for diagnostics via PC and MOVITOOLS® MotionStudio

4.5 Pin assignment

The assignment of connecting terminals is described in the DeviceNet specification (Volume I, Appendix A).



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The DFD11B option card is opto-decoupled on the driver side in accordance with the DeviceNet specification (Volume I, Chapter 9). This means the CAN bus driver must be powered with 24 V voltage via the bus cable. The cable to be used is also described in the DeviceNet specification (Volume I, Appendix B). The connection must be made according to the color code specified in the following table.

Pin no.	Signal	Meaning	Color coding
1	V–	0V24	BK
2	CAN_L	CAN_L	BU
3	DRAIN	DRAIN	blank
4	CAN_H	CAN_H	WH
5	V+	24 V	RD

DFD11B - DeviceNet connection

According to the DeviceNet Specification a linear bus structure without or with very short droplines is required.

The maximum permitted cable length depends on the baud rate setting:

Baud rate	Maximum cable length
500 kBaud	100 m
250 kBaud	250 m
125 kBaud	500 m

4.6 Shielding and routing bus cables

The DeviceNet interface supports RS-485 communications protocol and requires cable type A specified for DeviceNet in accordance with EN 50170 as shielded, twisted-pair cable for the physical connection.

Correct shielding of the bus cable attenuates electrical interference that may occur in industrial environments. The following measures ensure the best possible shielding:

- Manually tighten the mounting screws on the connectors, modules, and equipotential bonding conductors.
- Apply the shielding of the bus cable on both ends over a large surface.
- Route signal and bus cables in separate cable ducts. Do not route them parallel to power cables (motor leads).
- Use metallic, grounded cable racks in industrial environments.
- Route the signal cable and the corresponding equipotential bonding close to each other using the shortest possible route.
- Avoid using plug connectors to extend bus cables.
- Route the bus cables closely along existing grounding surfaces.

STOP!

In case of fluctuations in the ground potential, a compensating current may flow via the bilaterally connected shield that is also connected to the protective earth (PE). Make sure you supply adequate equipotential bonding according in accordance with relevant VDE regulations in such a case.

4.7 Bus termination

In order to avoid disruptions in the bus system due to reflections, each DeviceNet segment must be terminated with 120 Ω bus terminating resistors at the first and last physical participant. Connect the bus terminating resistor between connections 2 and 4 of the bus plug.

4.8 Setting the DIP switches

	NOTE
	Before changing a DIP switch setting, disconnect the drive inverter from power (supply voltage and 24 V backup operation). The DIP switch settings are adopted during initialization of the driver inverter only.

Setting the MAC-ID

The MAC-ID (**M**edia **A**ccess **C**ontrol **Id**entifier) is set on the DFD11B option card with DIP switches S1-NA0 ... S1-NA5. in a binary coded manner. The MAC-ID represents the node address of the DFD11B. The DFD11B supports the address range 0 ... 63.

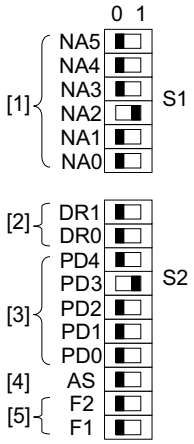
Setting the baud rate

The baud rate is set with DIP switches S2-DR0 and S2-DR1.

DIP switch S2		Baud rate
DR1	DR0	
0	0	125 kBaud
0	1	250 kBaud
1	0	500 kBaud
1	1	Invalid

Setting the process data length

Up to ten data words (DFD11B in MOVIDRIVE® B) and up to 24 data words (DFD11B as gateway in MOVITRAC® B or UOH11B) can be exchanged between the DeviceNet master and the DFD11B. The number is set with DIP switches S2-PD0 to S2-PD4 in a binary coded manner.



[1] Setting the MAC-ID
[2] Setting the baud rate
[3] Setting the process data length
[4] Auto setup for gateway operation
[5] No function

The figure depicts the following settings:
MAC-ID: 4
Baud rate: 125 kBaud
Process data length: 8 PD

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Configuring the SBus communication of the gateway

The "AS" DIP switch is used to configure the SBus communication of the gateway (→ chapter "Auto setup for gateway operation").

The configuration is carried out when the "AS" DIP switch is set from "0" to "1". For further operation, the "AS" DIP switch must remain in position "1" (= ON).

4.9 DFD11B option card - status LED

The DFD11B option card is equipped with four two-color LEDs for diagnostic of the DeviceNet system; these indicate the current status of the DFD11B and the DeviceNet system. The unit status corresponding to the status of the LED is is described in chapter 'Error diagnostics'.

LED abbreviation	Complete LED designation
MOD/NET	Module/Network Status
PIO	Polled I/O
BIO	Bit-Strobe I/O
BUS FAULT	BusFAULT

MOD/NET LED

The function of the LED **Mod/Net** described in the following table is contained in the DeviceNet specification.

LED	Status	Meaning
Off	Not switched on / OffLine	• Unit is off-line • Unit performs DUP MAC check • Unit is switched off
Flashing green (1 s cycle)	Online and in operational mode	• The unit is on-line and no connection has been established • DUP MAC check performed successfully • A connection to a master has not been established yet • Missing, incorrect or incomplete configuration
Green light	Online, operational mode and connected	• Online • Connection to a master has been established • Connection is active (established state)
Flashing red (1 s cycle)	Minor fault or connection timeout	• A correctable error has occurred • A device error is active (MOVIDRIVE® B / gateway) • Polled I/O or/and bit-strobe I/O connections are in timeout state • DUP-MAC check has detected an error
Red light	Critical fault or critical link failure	• A correctable error has occurred • Bus fault • DUP-MAC check has detected an error

PIO LED

The **PIO** LED checks the polled I/O connection.

LED	Status	Meaning
Flashing green (125 ms cycle)	DUP-MAC check	Unit is performing DUP-MAC check
Off	Not switched on / off-line but not DUP-MAC check	• Unit is off-line • Unit is switched off
Flashing green (1 s cycle)	Online and in operational mode	• Unit is on-line • DUP MAC check performed successfully • A PIO connection to a master is being established (configuring state) • Missing, incorrect or incomplete configuration
Green light	Online, operational mode and connected	• Online • A PIO connection has been established (established state)
Flashing red (1 s cycle)	Minor fault or connection timeout	• Invalid baud rate setting via DIP switches • A correctable error has occurred • Polled I/O connection is in timeout state
Red light	Critical fault or critical link failure	• An error that cannot be remedied has occurred • Bus fault • DUP-MAC check has detected an error

BIO LED

The **BIO** LED checks the bit-strobe I/O connection.

LED	Status	Meaning
Flashing green (125 ms cycle)	DUP-MAC check	Unit is performing DUP-MAC check
Off	Not switched on / off-line but not DUP-MAC check	• Unit is off-line • Unit is switched off
Flashing green (1 s cycle)	Online and in operational mode	• Unit is on-line • DUP MAC check performed successfully • A BIO connection to a master is being established (configuring state) • Missing, incorrect or incomplete configuration
Green light	Online, operational mode and connected	• Online • A BIO connection has been established (established state)
Flashing red (1 s cycle)	Minor fault or connection timeout	• Invalid number of process data is set via DIP switches • A correctable error has occurred • Bit-strobe I/O connection is in timeout state
Red light	Critical fault or critical link failure	• An error that cannot be remedied has occurred • Bus fault • DUP-MAC check has detected an error

BUS-FAULT LED

The **BUS-FAULT** LED displays the physical status of the bus node.

Status of the BUS FAULT LED	Status	Meaning
Off	NO ERROR	The number of bus errors is in the normal range (error active status).
Flashing red (125 ms cycle)	BUS WARNING	The unit is performing a DUP-MAC check and cannot send any messages because no other stations are connected to the (bus error passive state)
Flashing red (1 s cycle)		The number of physical bus errors is too high. No more error telegrams are actively written to the bus (error passive state).
Red light	BUS ERROR	• Bus-fault state • The number of physical bus errors has increased despite a switch to the error-passive state. Access to the bus is switched off.
Yellow light	POWER OFF	External voltage supply via X30 has been turned off or is not connected.

Power-UP test

A power-up test of all LEDs takes place once the drive inverter has been switched on. The LEDs are switched on in the following sequence:

Time in [ms]	MOD/NET LED	PIO LED	BIO LED	BUS FAULT LED
0	Green	Off	Off	Off
250	Red	Off	Off	Off
500	Off	Green	Off	Off
750	Off	Red	Off	Off
1000	Off	Off	Green	Off
1250	Off	Off	Red	Off
1500	Off	Off	Off	Green
1750	Off	Off	Off	Red
2000	Off	Off	Off	Off

5 Project Planning and Startup

This section provides you with information on project planning for the DeviceNet master and startup of the drive inverter for fieldbus operation.

	NOTE
	The current version of the EDS file for the DFD11B option card is available on the SEW homepage (http://www.sew-eurodrive.de) under the heading "Software".

5.1 Validity of the EDS files for DFD11B

	NOTE
	Entries in the EDS file must not be changed or expanded. SEW assumes no liability for inverter malfunctions caused by a modified EDS file!

Two different EDS files are available for the configuration of the master (DeviceNet-Scanner) for the DFD11B:

- if DFD11B is used as a fieldbus option in MOVIDRIVE® B, the EDS file SEW_MOVIDRIVE_DFD11B.eds is required
- if DFD11B is used as a gateway in MOVITRAC® B or in the gateway housing (UOH11B), the EDS file SEW_GATEWAY_DFD11B.eds is required

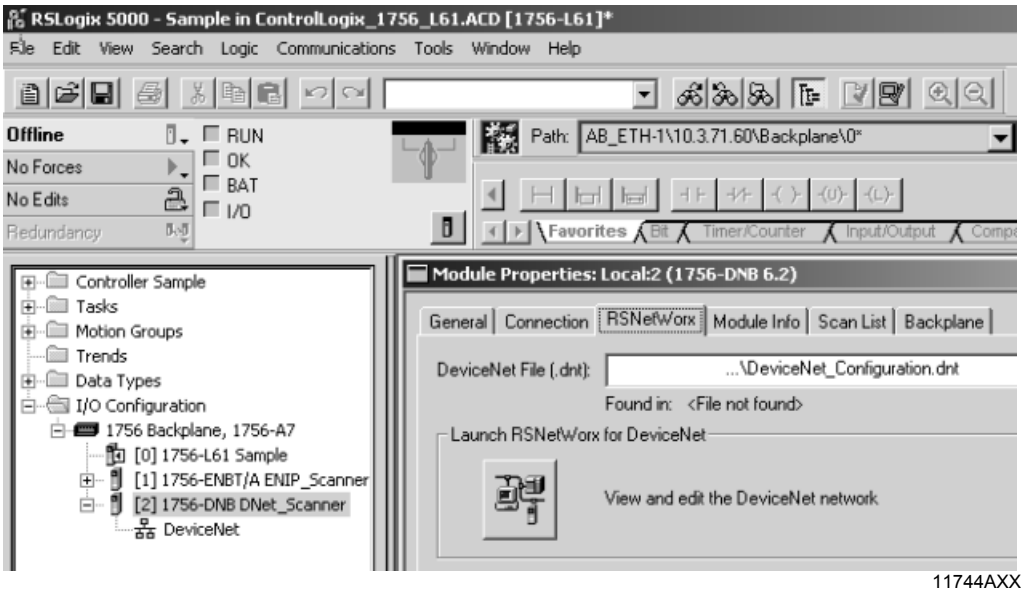
Install the following files with the RSNetWorx software to build the DeviceNet network with the DFD11B option: Proceed as follows:

- Select the menu item <Tools/EDS-Wizard> in RSNetWorx. You will be prompted to enter the names of the EDS and Icon file.
- The files will be installed. For detailed information on the installation of the EDS file, refer to the Allen Bradley documentation for RSNetWorx.
- After installation, the device is available in the device list under the entry "Vendor/SEW EURODRIVE GmbH".

5.2 Configuring PLC and master (DeviceNet scanner)

The following samples refer to the usage of an Allen-Bradley-PLC ControlLogix 1756-L61 together with the RSLogix 5000 programming software and the DeviceNet RSNetWorx configuration software for DeviceNet.

After adding the DeviceNet Scanner to the I/O configuration, the file *.dnt containing the DeviceNet configuration is selected. To view and edit the DeviceNet configuration, RSNetWorx can be launched from this dialog (→ following figure).



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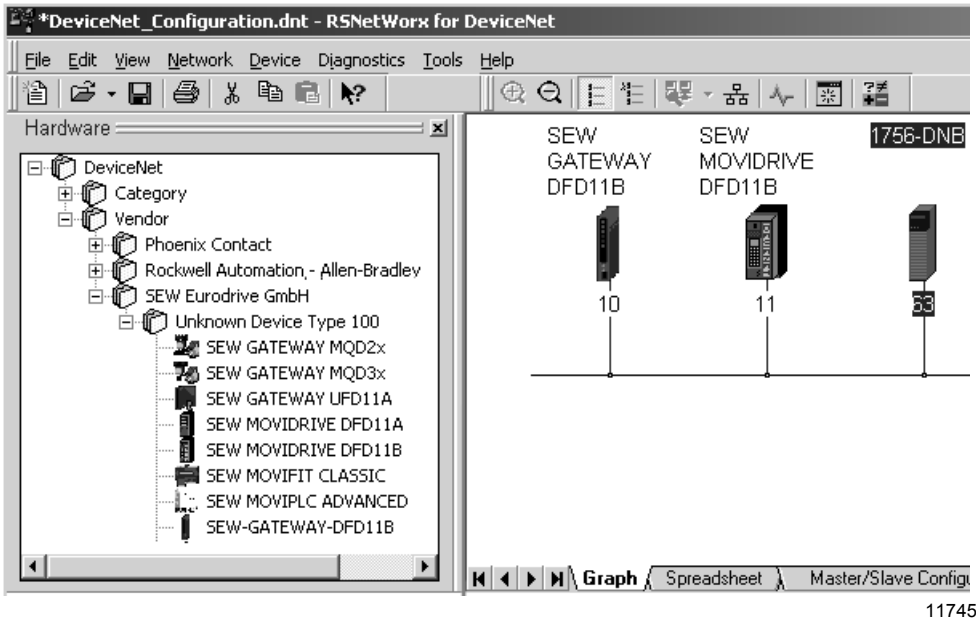
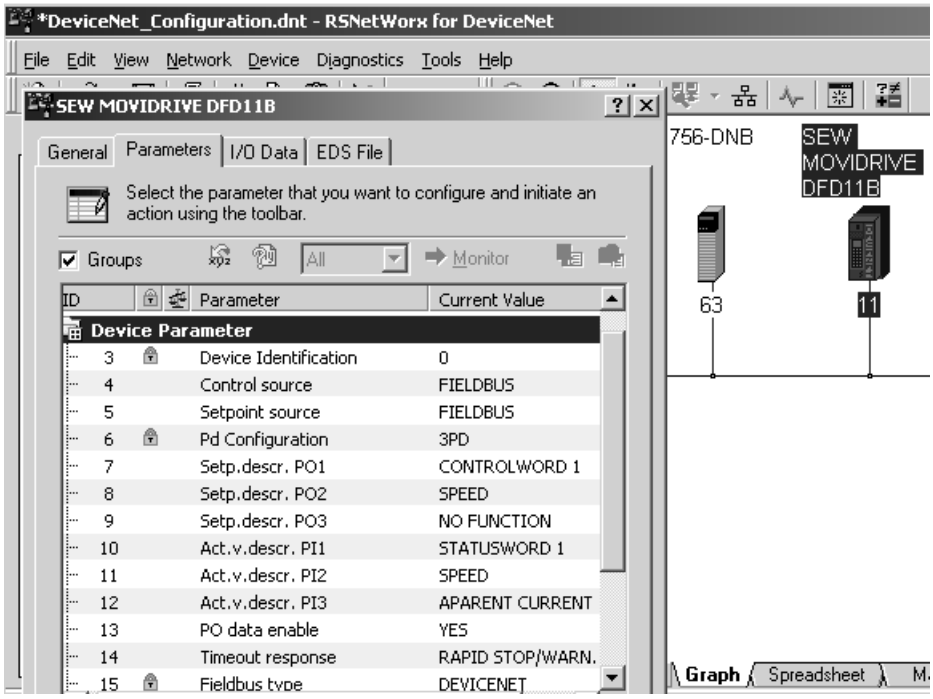
In RSNetWorx for DeviceNet (→ following figure), either perform an online scan or add the required devices to the graph by drag and drop. The address given under the icon of the device must be equal to the MAC-ID set by the DIP switches of the DFD11B. If the required devices are not in the selection list, corresponding EDS files have to be registered via [Tools] / [Wizard].



11745AXX

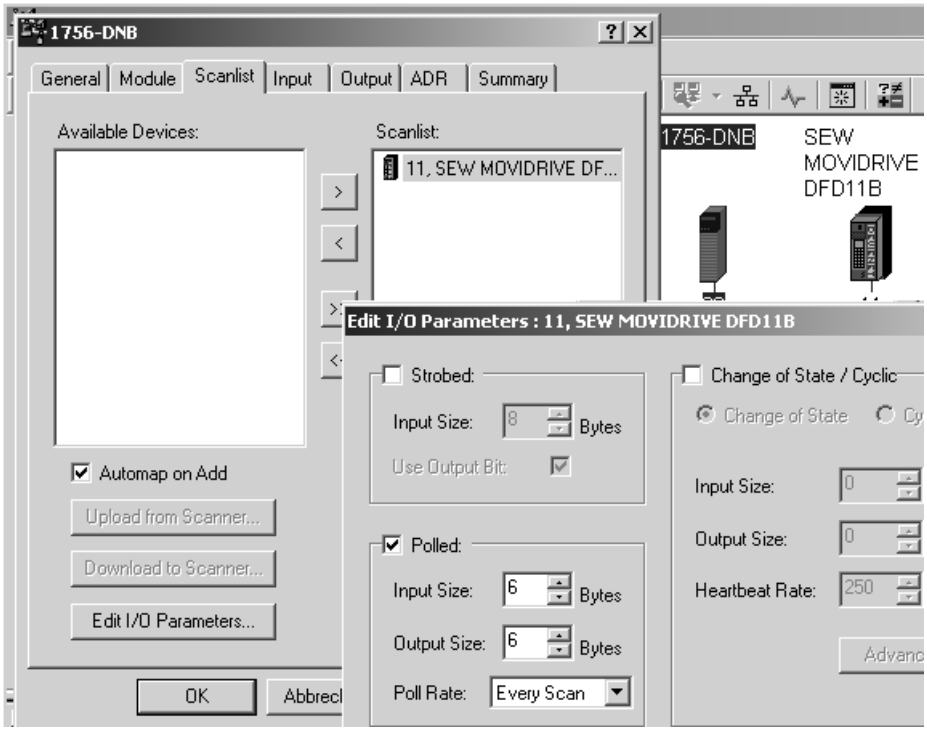
5.2.1 DFD11B as fieldbus option in MOVIDRIVE® B

By reading the device properties in online mode, the process data (Pd) configuration of the DFD11B can be checked (→ following figure).


*DeviceNet_Configuration.dnt - RSNetWorx for DeviceNet
File Edit View Network Device Diagnostics Tools Help
SEW MOVIDRIVE DFD11B
General Parameters I/O Data EDS File
Select the parameter that you want to configure and initiate an action using the toolbar.
Groups
All
Monitor
ID Parameter Current Value
Device Parameter
3 Device Identification 0
4 Control source FIELDBUS
5 Setpoint source FIELDBUS
6 Pd Configuration 3PD
7 Setp.descr. PO1 CONTROLWORD 1
8 Setp.descr. PO2 SPEED
9 Setp.descr. PO3 NO FUNCTION
10 Act.v.descr. PI1 STATUSWORD 1
11 Act.v.descr. PI2 SPEED
12 Act.v.descr. PI3 APARENT CURRENT
13 PO data enable YES
14 Timeout response RAPID STOP/WARN.
15 Fieldbus type DEVICENET
756-DNB
SEW MOVIDRIVE DFD11B
63
11
Graph Spreadsheet

11746AXX

The parameter 'Pd configuration' gives the number (1 ... 10) of process data words (PD) set via DIP switches PD(0) ... PD(4)and defines the I/O parameter for the DeviceNet scanner (→ following figure).



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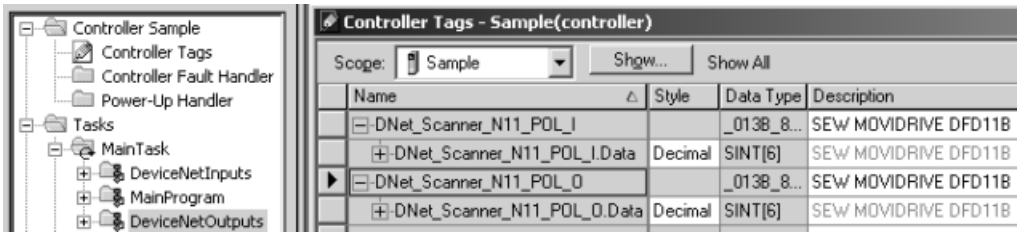
After adding the MOVIDRIVE® B with DFD11B to the scanlist, the number of Polled I/O Bytes must be set to 2 × number of PD (e. g. number of PD = 3 × number of polled input-Bytes = 6 and output-Bytes = 6) via [Edit I/O Parameters]. When the DeviceNet configuration is saved and downloaded into the scanner, RSNetWorx can be closed.

Depending on the DeviceNet configuration and the mapping rules in the scanner, the data from and to DeviceNet units is packed into a DINT-Array that is transferred from the scanner to the local I/O tags of the Logix-Processor.

In order not to have to search for the data from a certain device in this array manually, the 'DeviceNet Tag Generator' tool generates copy commands and two controller tags (Input & Output) for each DeviceNet device as a byte-array.

The tag-name contains the MAC-ID of the DeviceNet unit and 'POL_I' for polled input data or 'POL_O' for polled output data (→ following figure).



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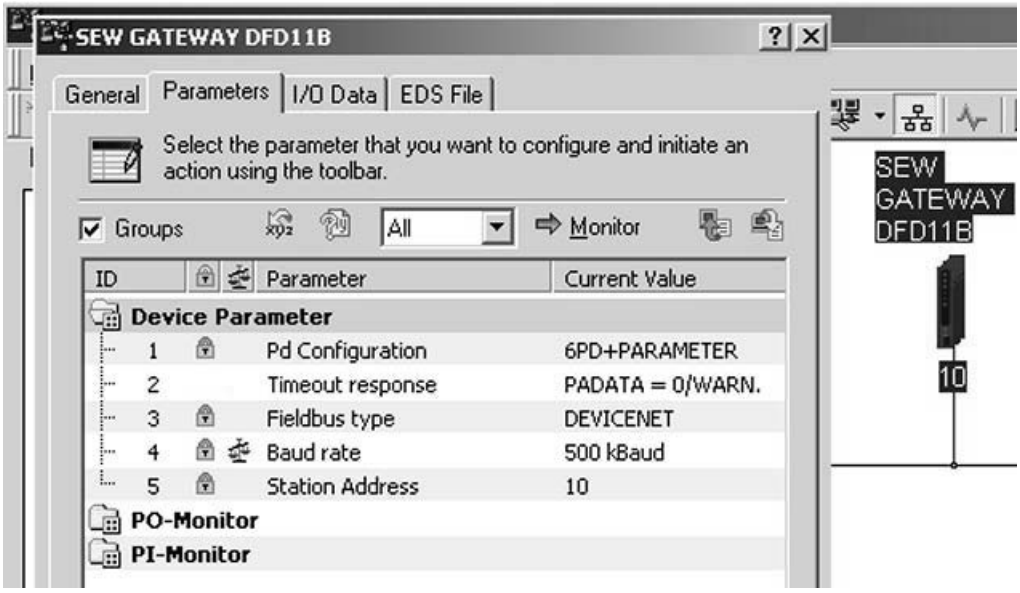
The content of the process data words 1 ... 3 from and to MOVIDRIVE® B is defined via parameter P870 ... P875. The content of the process data words 4 ... 10 is defined by an IPOS$^{plus®}$ program or an application module.

5.2.2 DFD11B as fieldbus gateway in MOVITRAC® B or UOH11B gateway housing

By reading the device properties in online mode, the process data (Pd) configuration of the DFD11B can be checked (→ following figure).



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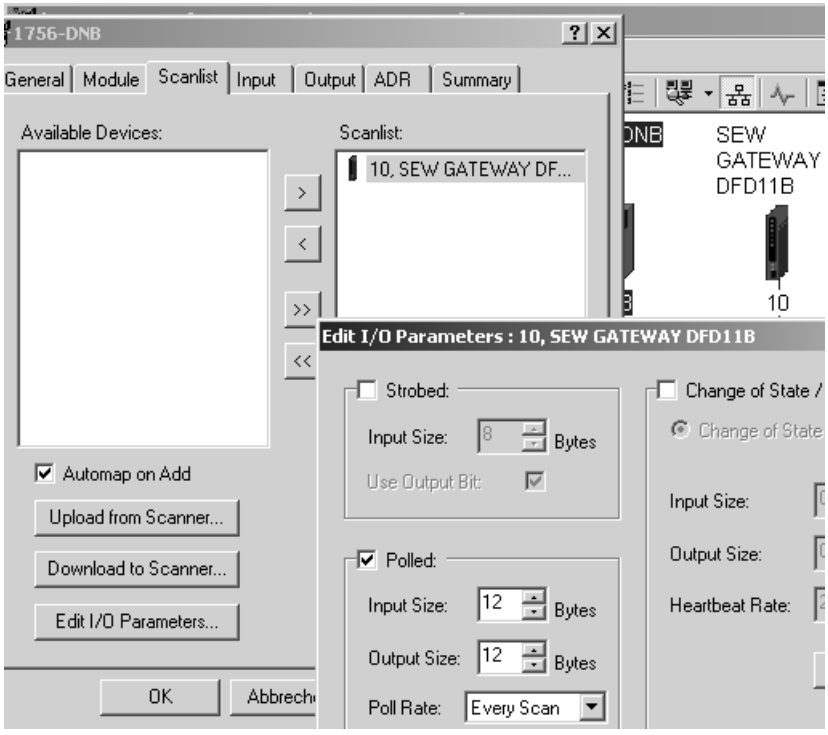
The parameter 'Pd configuration' gives the number (3 ... 24) of process data words (PD) set via DIP switches PD(0) ... PD(4). The number of process data words must be 3 × number of drives (1 ... 8) connected via SBus to the DFD11B gateway. The number of PD then gives the I/O parameter for the DeviceNet Scanner (→ following figure).



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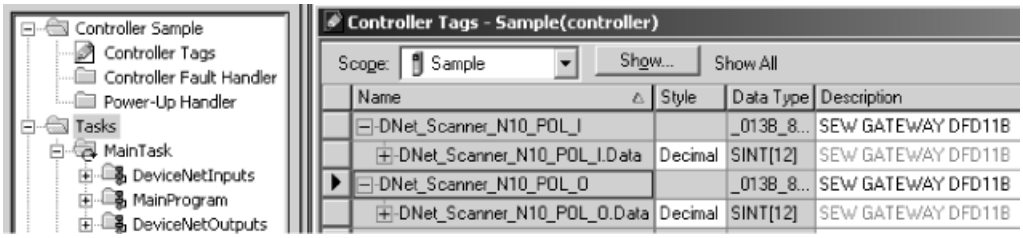
After adding the DFD11B gateway to the scanlist, the number of polled I/O Bytes must be set to 2 × number of PD (e. g. number of PD = 6 × number of polled input-Bytes = 12 and output-Bytes = 12) via 'Edit I/O Parameters'. When the DeviceNet configuration is saved and downloaded into the scanner, RSNetWorx can be closed.

Depending on the DeviceNet configuration and the mapping rules in the scanner, the data from and to DeviceNet units is packed into a DINT-Array that is transferred from the scanner to the local I/O tags of the Logix-Processor.

In order not to have to search for the data from a certain device in this array manually, the 'DeviceNet Tag Generator' tool generates copy commands and two controller tags (Input & Output) for each DeviceNet device as a byte-array.

The tag-name contains the MAC-ID of the DeviceNet unit and 'POL_I' for polled input data or 'POL_O' for polled output data (→ following figure).



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In this Byte arrays from and to the DFD11B gateway the data is transferred to the drives connected to the SBus of this gateway as follows:

- Byte 0 ... 5 contain PD 1 ... 3 of the drive with the lowest SBus address (e. g. 1)
- Byte 6 ... 11 contain PD 1 ... 3 of the drive with the next higher SBus address (e. g. 2)

The content of process data word 1 ... 3 from and to the drives is defined in each drive individually via parameter P870 ... P875.

5.2.3 Auto setup for gateway operation

The auto setup function lets you start up the DFD11B as gateway without a PC. The function is activated via the Auto Setup DIP switch (see section 4.4 page 16)

	NOTE
	Setting the Auto-Setup DIP switch (AS) from OFF to ON position causes the function to be executed once. **The Auto Setup DIP switch must then remain in the ON position.**The function can be reactivated by turning the DIP switch off and back on again.

As a first step, the DFD11B searches for drive inverters on the lower-level SBus. This process is indicated by the **H1** LED (system bus error) flashing briefly. For this purpose, different SBus addresses must be set for the drive inverters (P881). We recommend assigning the addresses beginning with address 1 in ascending order based on the arrangement of inverters in the switch cabinet. The process image on the fieldbus side is expanded by three words for each detected drive inverter.

The **H1** LED remains lit if no drive inverter was located. A total of up to eight drive inverters is taken into account.

After the search is completed, the DFD11B periodically exchanges three process data words with each connected drive inverter. The process output data are fetched from the fieldbus, divided into blocks of three and transmitted. The drive inverters read the process input data, put them together and send them to the fieldbus master.

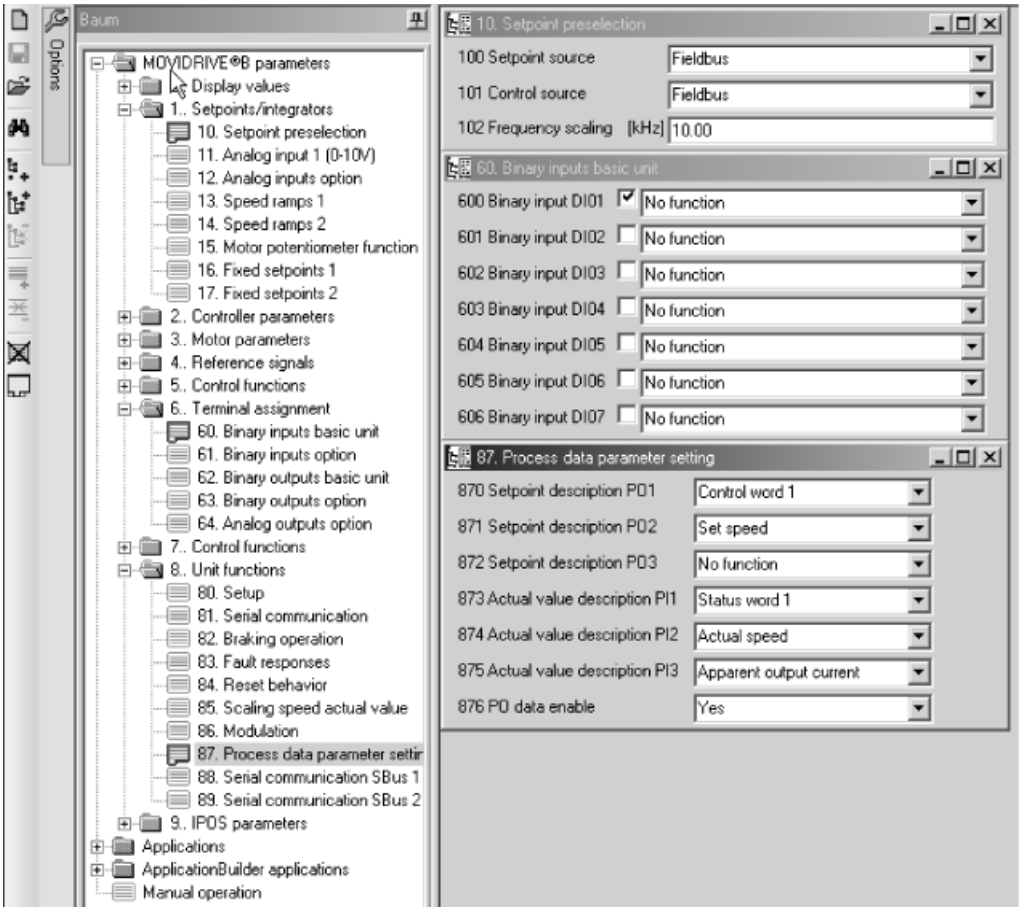
The cycle time of the SBus communication is 2 ms per node at a baud rate of 500 kBit/s without any additional engineering activities.

Thus, for an application with 8 inverters on the SBus, the cycle time of the process data update is then 8 x 2 ms = 16 ms.

	NOTE
	If you change the process data assignment of the drive inverters connected to the DFD11B, you have to activate Auto Setup again because the DFD11B saves these values only once during Auto Setup. The process data assignments of the connected drive inverters may not be changed dynamically after Auto Setup.

5.3 Configuring the MOVIDRIVE® MDX61B drive inverter

The following settings are required for simple fieldbus operation.



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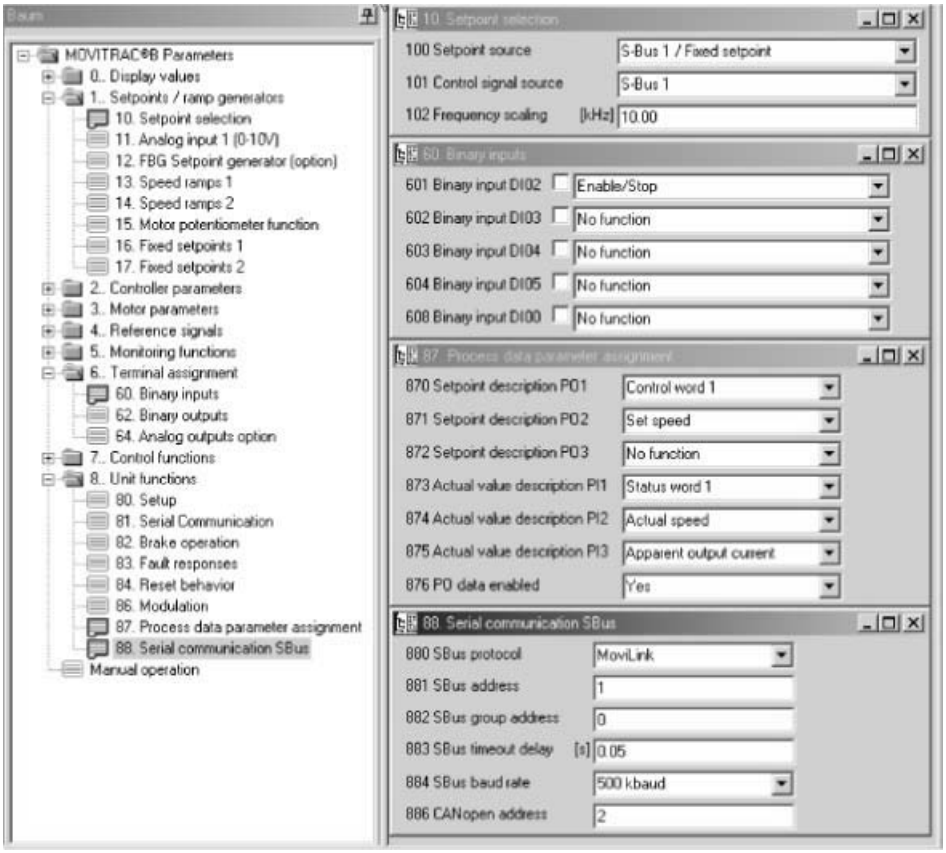
However, to control the MOVIDRIVE® B drive inverter via DeviceNet, you must first switch the drive inverter to control signal source (P101) and setpoint source (P100) = FIELDBUS. The FIELDBUS setting means the drive inverter parameters are set for control and setpoint entry via DeviceNet. The MOVIDRIVE® B drive inverter then responds to the process output data transmitted by the PLC.

The parameters of the MOVIDRIVE® B drive inverter can be set straight away via DeviceNet without any further settings once the DeviceNet option card has been installed. For example, all parameters can be set by the PLC after power-on.

Activation of the control signal source and setpoint source FIELDBUS is signaled to the machine controller using the "Fieldbus mode active" bit in the status word.

For safety reasons, you must also enable the MOVIDRIVE® B drive inverter at the terminals for control via the fieldbus system. Therefore, you must wire and program the terminals in such a way that the inverter is enabled via the input terminals. For example, the simplest way of enabling the drive inverter at the terminals is to connect the DIØØ (function / CONTROLLER INHIBIT) input terminal to a DC +24 V signal and to program input terminals DIØ1 ... DIØ7 to NO FUNCTION.

5.4 Configuring the MOVITRAC® B frequency inverter



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To control the MOVITRAC® B frequency inverter via DeviceNet, you must switch the drive inverter to **control signal source (P101)** and **setpoint source (P100)** = SBus beforehand. The SBus setting means the MOVITRAC® B parameters are set for control and setpoint entry via gateway. The MOVITRAC® B then responds to the process output data transmitted by the PLC.

It is necessary to set the SBus1 timeout interval (P883) to a value other than 0 ms for the MOVITRAC® B inverter to stop if faulty SBus communication is encountered. We recommend a value in the range 50 ... 200 ms. Activation of the control signal source and setpoint source SBus is signaled to the higher-level controller using the "SBus mode active" bit in the status word.

For safety reasons, you must also enable the MOVITRAC® B at the terminals for control via the fieldbus system. Therefore, you must wire and program the terminals in such a way that the MOVITRAC® B is enabled via the input terminals. The simplest way of enabling the MOVITRAC® B at the terminals is, for example, to connect the DIØ1 (function CW/STOP) input terminal to a +24-V signal and to program the remaining input terminals to NO FUNCTION.

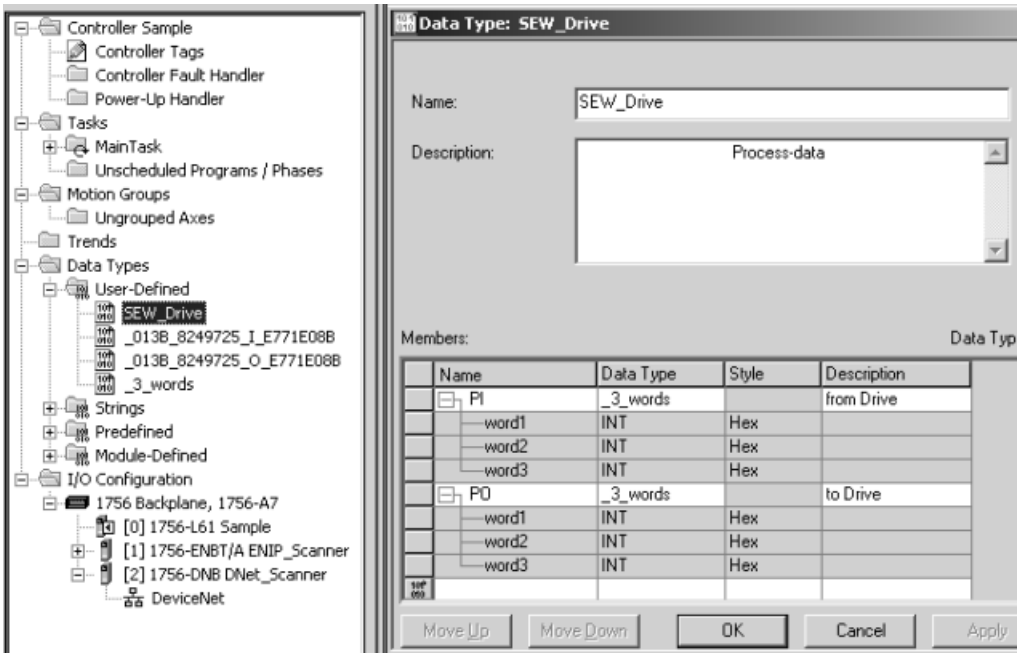
	NOTE
	Set the parameter *P881 SBus address* to values between 1 to 8 in ascending order 8. A MOVITRAC® B with integrated DFD11B has the SBus address 1 as factory setting (as of firmware .15). The SBus address 0 is used by the DFD11B gateway and must therefore not be used. Set *P883 SBus timeout* to values between 50 ... 200 ms

5.5 Programming samples in RSLogix 5000

5.5.1 MOVIDRIVE® B with 3 PD data exchange

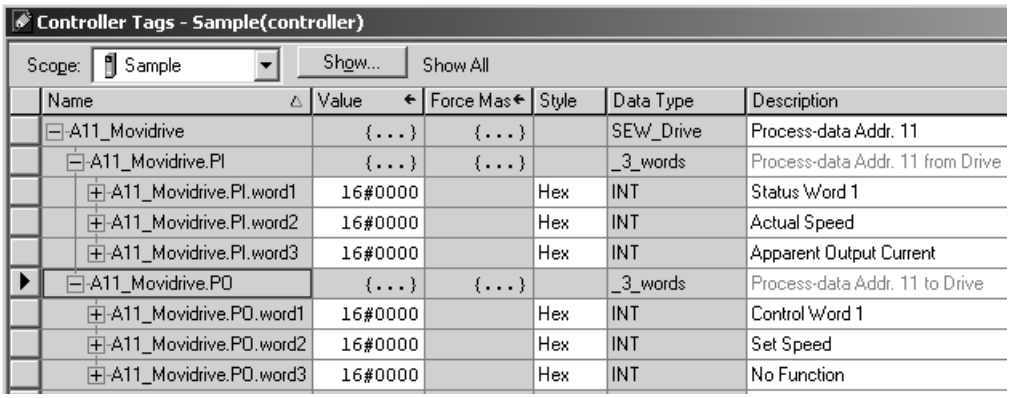
1. Set the DIP switches on the DFD11B to
   - adjust the baud rate to the DeviceNet network
   - set the address (MAC-ID) to a value used by no other node
   - set the number of PD (according to this sample) to 3
2. Then follow chapter 5.2 and 5.2.1 to add MOVIDRIVE® B with DFD11B to the DeviceNet configuration.
3. Follow chapter 5.3 to set the communication parameters of MOVIDRIVE® B.
4. Now the integration into the RSLogix project can performed.

   Generate a controller tag with a user-defined data type to get a plain interface to the inverters process data (→ following figure)



11752AXX

The description for PI and PO data can be assigned to the controller tag fitting to the definitions made in MOVIDRIVE® B (→ chapter 5.3).



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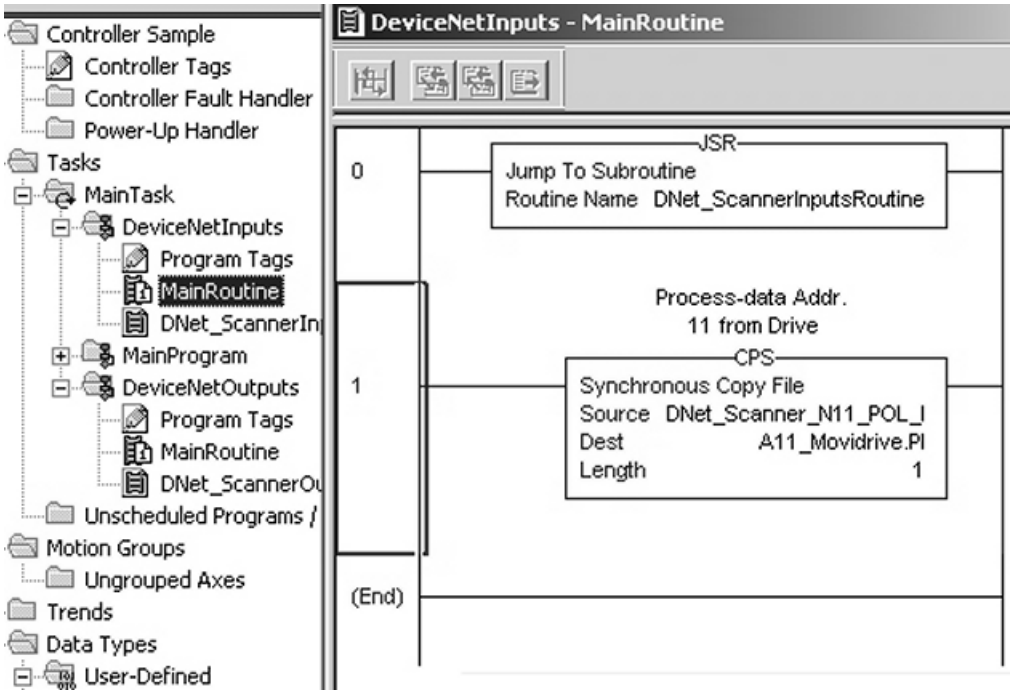
5. In order to copy the data from the drive to the new data structure, a CPS command is added into the 'MainRoutine' that reads the data from the local I/O (→ following figure).

   Make sure that this CPS command is executed **after** the automatically (by DeviceNet Tag Generator) generated *DNet_ScannerInputsRoutine*.



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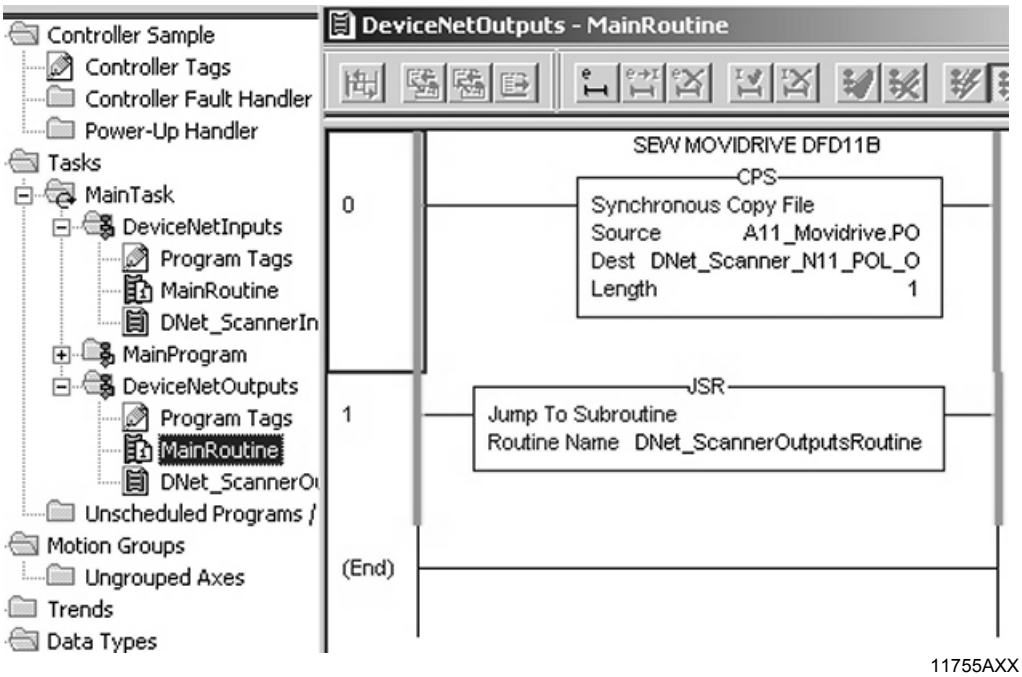
   In order to copy the data from the new data structure to the drive, a CPS command is added into the 'MainRoutine' that writes the data to the local I/O.

   Make sure that this CPS command is executed **before** the automatically (by DeviceNet Tag Generator) generated *DNet_ScannerOutputsRoutine*.



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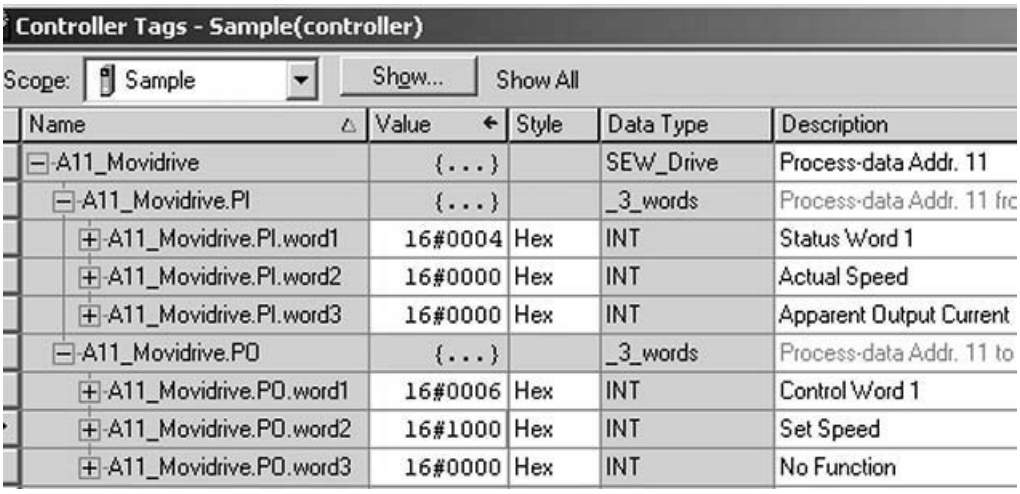
6. Finally save and download the project to the PLC. set the PLC to Run Mode and set the *Scanner CommandRegister.Run* to '1' to activate the data exchange via DeviceNet.

   Now the actual values from the device can be read and setpoint values can written.



Name	Value	Style	Data Type	Description
A11_Movidrive	{...}		SEW_Drive	Process-data Addr. 11
A11_Movidrive.PI	{...}		_3_words	Process-data Addr. 11 fro
A11_Movidrive.PI.word1	16#0004	Hex	INT	Status Word 1
A11_Movidrive.PI.word2	16#0000	Hex	INT	Actual Speed
A11_Movidrive.PI.word3	16#0000	Hex	INT	Apparent Output Current
A11_Movidrive.PO	{...}		_3_words	Process-data Addr. 11 to
A11_Movidrive.PO.word1	16#0006	Hex	INT	Control Word 1
A11_Movidrive.PO.word2	16#1000	Hex	INT	Set Speed
A11_Movidrive.PO.word3	16#0000	Hex	INT	No Function

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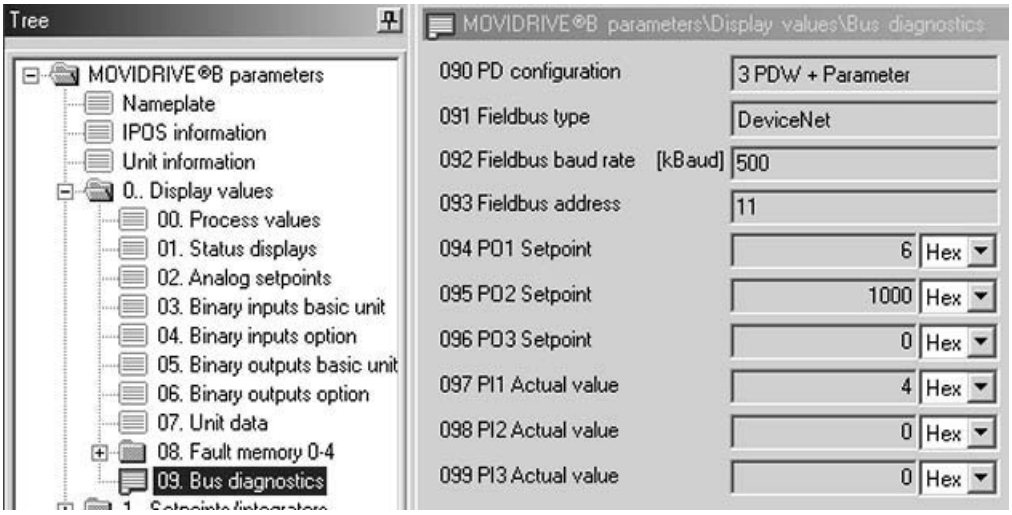
The data in the controller tags should be equal to the process data displayed in the parameter tree of MOVITOOLS® MotionStudio (→ following figure).



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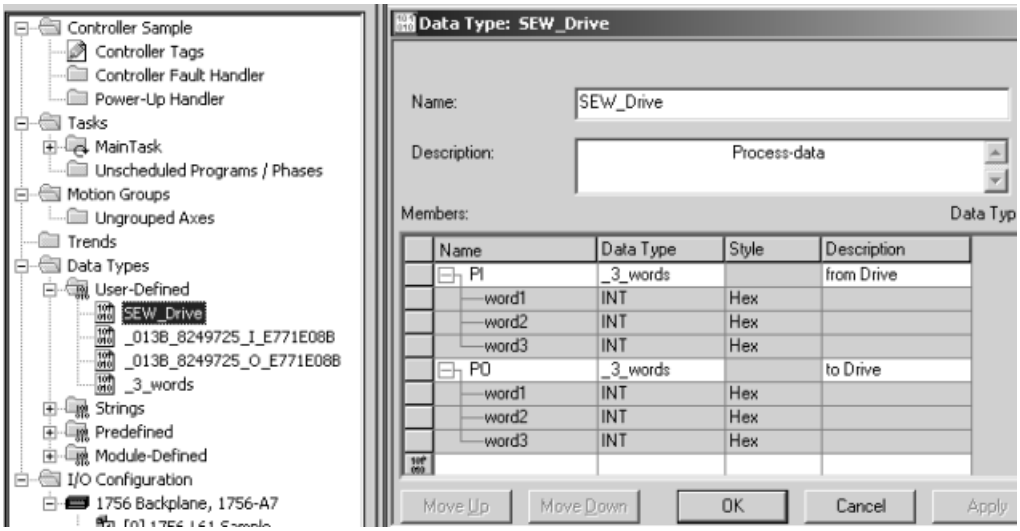
5.5.2 Two MOVITRAC® B via DFD11B / UOH11B gateway

1. Set the DIP switches on the DFD11B to
   - adjust the baud rate to the DeviceNet network
   - set the address (MAC-ID) to a value used by no other node
   - set the number of PD (according to this sample) to 6
2. Then follow chapter 5.2 and 5.2.2 to add the DFD11B gateway to the DeviceNet configuration.
3. Execute the Auto Setup Function of the DFD11B gateway according to chapter 5.3 to configure the data-mapping to the drives.
4. Follow chapter 5.4 to set the communication parameters of MOVITRAC® B.
5. Now the integration into the RSLogix project can performed.

   Generate a controller tag with a user-defined data type to get a plain interface to the inverters process data (→ following figure)



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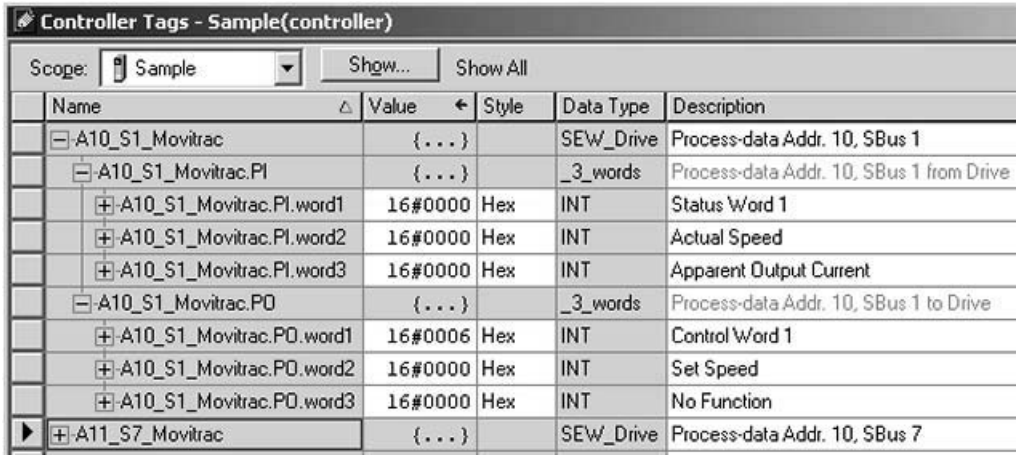
The description for PI and PO data can be assigned to the controller tag fitting to the definitions made in MOVITRAC® B (→ chapter 5.4).



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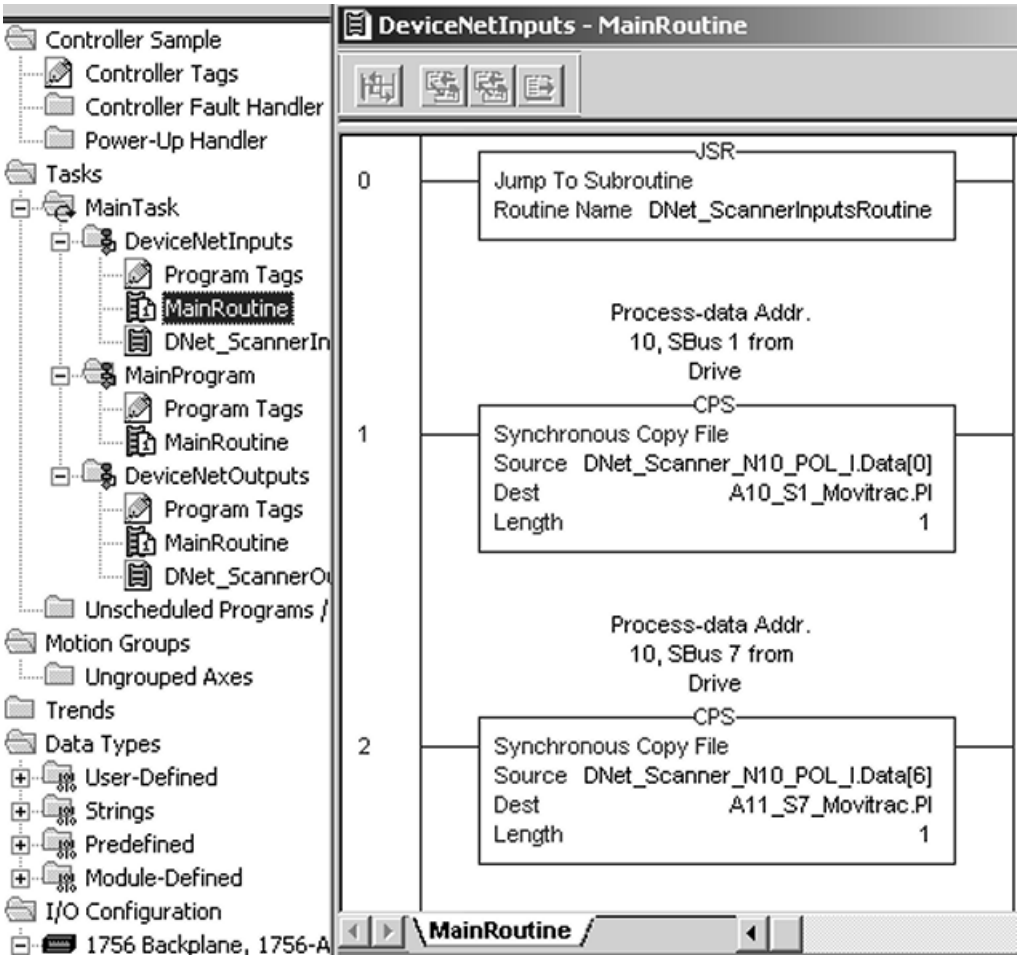
6. In order to copy the data from the drive to the new data structure, CPS commands are added into the 'MainRoutine' that read the data from the local I/O (→ following figure).

   Make sure that these CPS commands are executed **after** the automatically (by DeviceNet Tag Generator) generated *DNet_ScannerInputsRoutine*.



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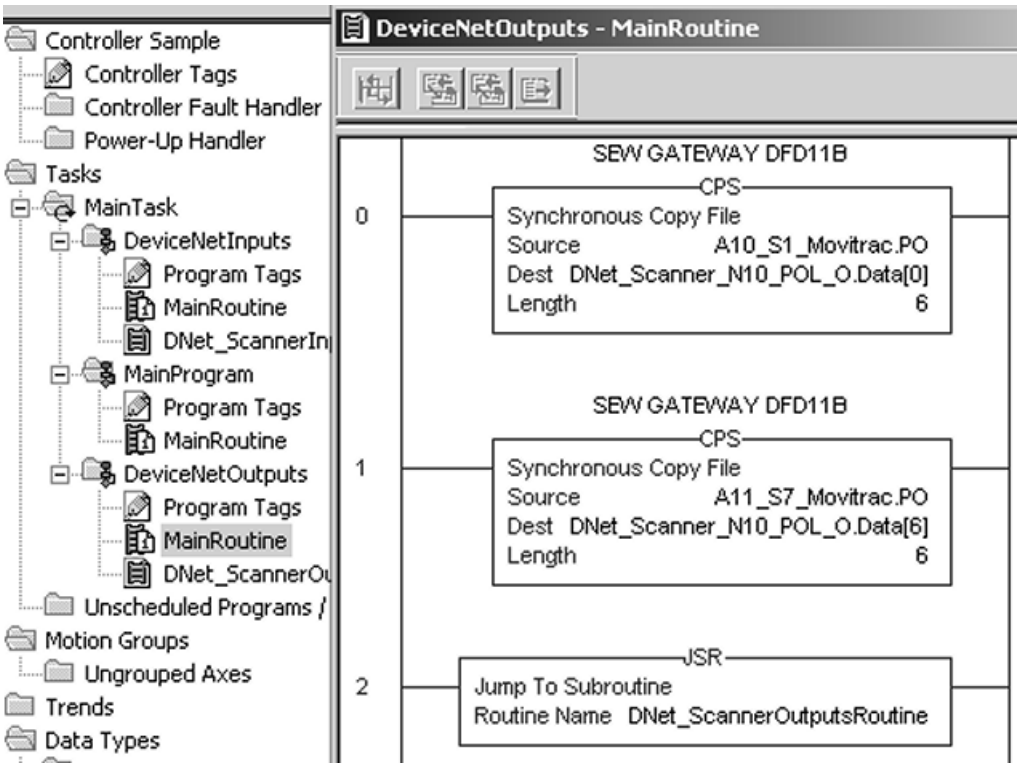
Please note that the structure DNet_Scanner_N10_POL_I.Data contains the PD from all drives on the gateway, so that the 6 data bytes of each drive have to be copied from the structure with a specific offset: [0], [6], [12] ... [42].

In order to copy the data from the new data structure to the drive, CPS commands are added into the 'MainRoutine' that write the data to the local I/O.

Make sure that these CPS commands are executed **before** the automatically (by DeviceNet Tag Generator) generated *DNet_ScannerOutputsRoutine*.

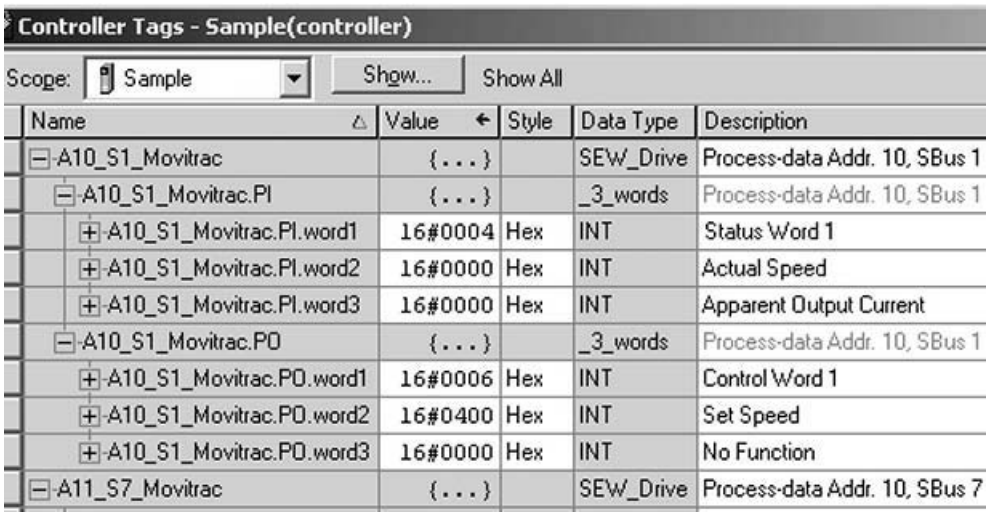


11760AXX

Please note that the structure DNet_Scanner_N10_POL_O.Data contains the PD to all drives on the gateway, so that the 6 data bytes of to each drive have to be copied to the structure with a specific offset: [0], [6], [12] ... [42].

7. Finally save and download the project to the PLC. set the PLC to Run Mode and set the *Scanner CommandRegister.Run* to '1' to activate the data exchange via DeviceNet.

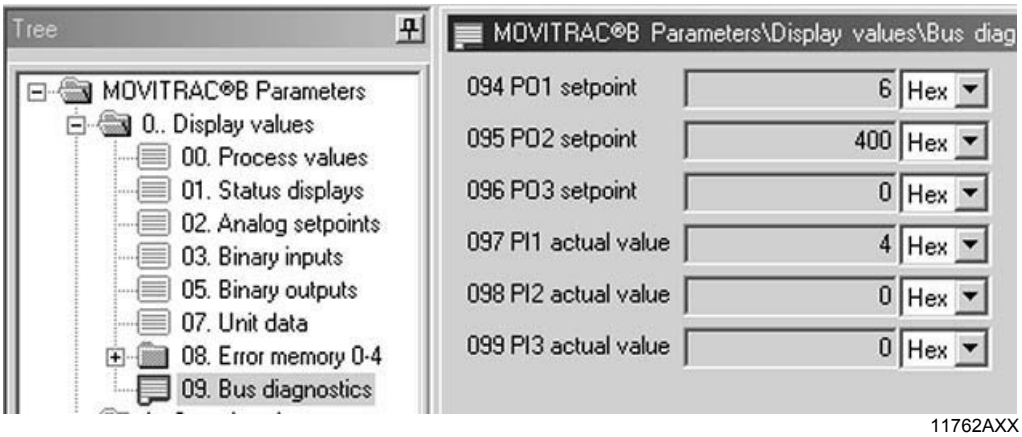
   Now the actual values from the device can be read and setpoint values can written (→ following figure).



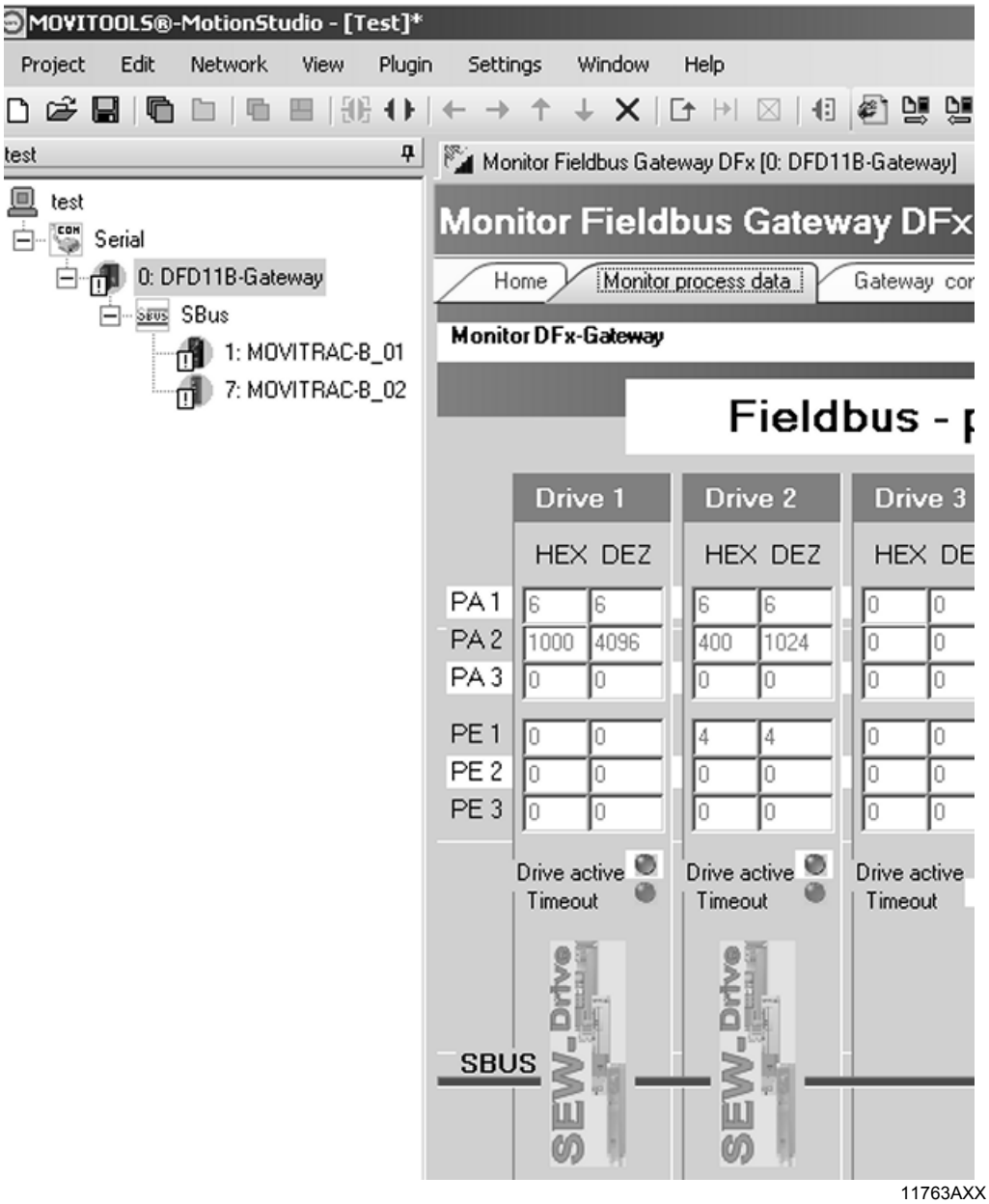
Name	Value	Style	Data Type	Description
A10_S1_Movitrac	{...}		SEW_Drive	Process-data Addr. 10, SBus 1
A10_S1_Movitrac.PI	{...}		_3_words	Process-data Addr. 10, SBus 1
A10_S1_Movitrac.PI.word1	16#0004	Hex	INT	Status Word 1
A10_S1_Movitrac.PI.word2	16#0000	Hex	INT	Actual Speed
A10_S1_Movitrac.PI.word3	16#0000	Hex	INT	Apparent Output Current
A10_S1_Movitrac.PO	{...}		_3_words	Process-data Addr. 10, SBus 1
A10_S1_Movitrac.PO.word1	16#0006	Hex	INT	Control Word 1
A10_S1_Movitrac.PO.word2	16#0400	Hex	INT	Set Speed
A10_S1_Movitrac.PO.word3	16#0000	Hex	INT	No Function
A11_S7_Movitrac	{...}		SEW_Drive	Process-data Addr. 10, SBus 7

11761AXX

The data in the controller tags should be equal to the process data displayed in the monitor for the DFx fieldbus gateway or in the parameter tree in MOVITOOLS® MotionStudio (→ following figures).



11762AXX

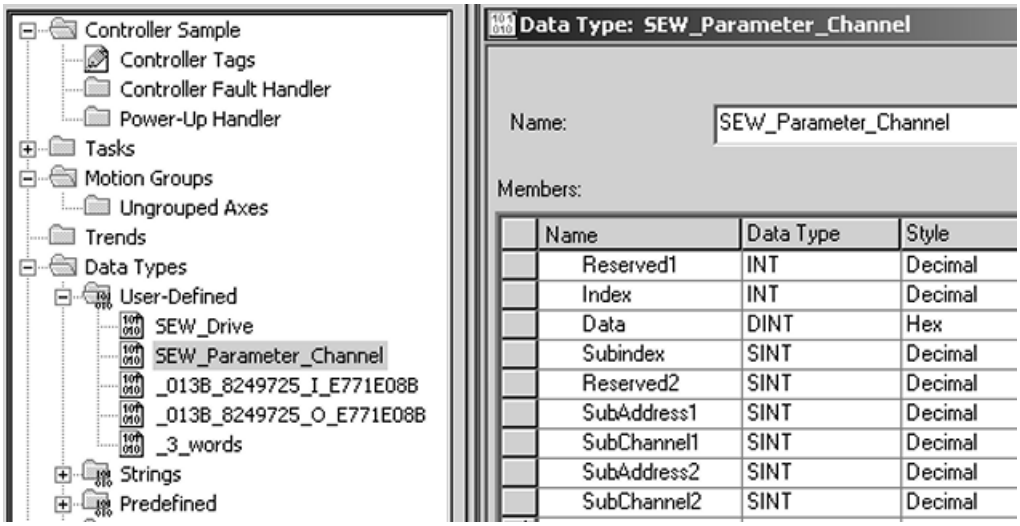


11763AXX

5.5.3 MOVIDRIVE® B parameter access

In order to get an easy-to-use read access to parameters of the MOVIDRIVE® B via *explicit messages* and the *register object*, follow the following steps:

1. Generate the user-defined data structure 'SEW_Parameter_Channel' (→ following figure)



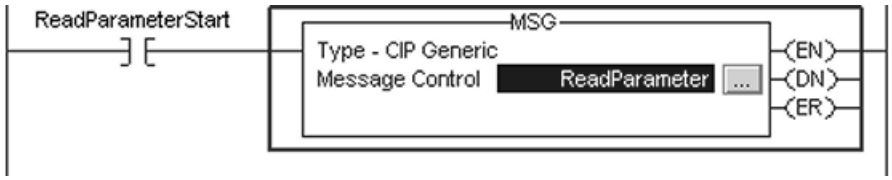
11764AXX

2. Define the controller tags (→ following figure).

Name	Data Type
ReadParameter	MESSAGE
ReadParameterRequest	SEW_Parameter_Channel
ReadParameterResponse	SEW_Parameter_Channel
ReadParameterStart	BOOL

11765AXX

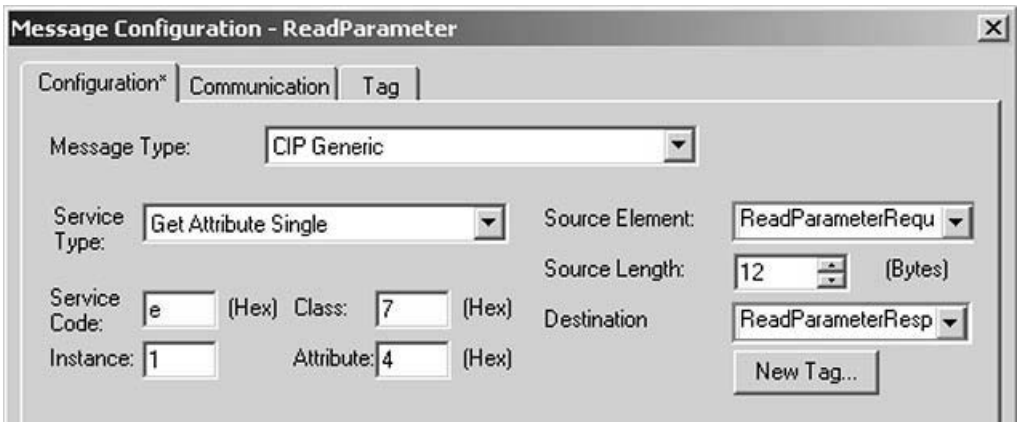
3. Create a Rung for the ReadParameter execution (→ following figure).



11766AXX

- For contact, select the tag 'ReadParameterStart'
- For the Message Control, select the tag 'ReadParameter'

4. Click on [...] in the MSG instruction to open the Message Configuration Window (→ following figure).



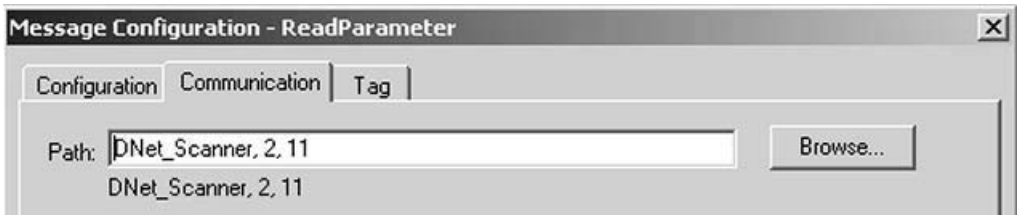
11767AXX

Select 'CIP Generic' as message type. Fill in the further data in the following order:

A Source Element = ReadParameterRequest.Index
B SourceLength = 12
C Destination = ReadParameterResponse.Index
D Class = 7_{hex}
E Instance = 1
F Attribute = 4_{hex}
G Service Code = e_{hex}

The Service Type is set automatically.

5. The target device is to be specified on the Communication tab (→ following figure).

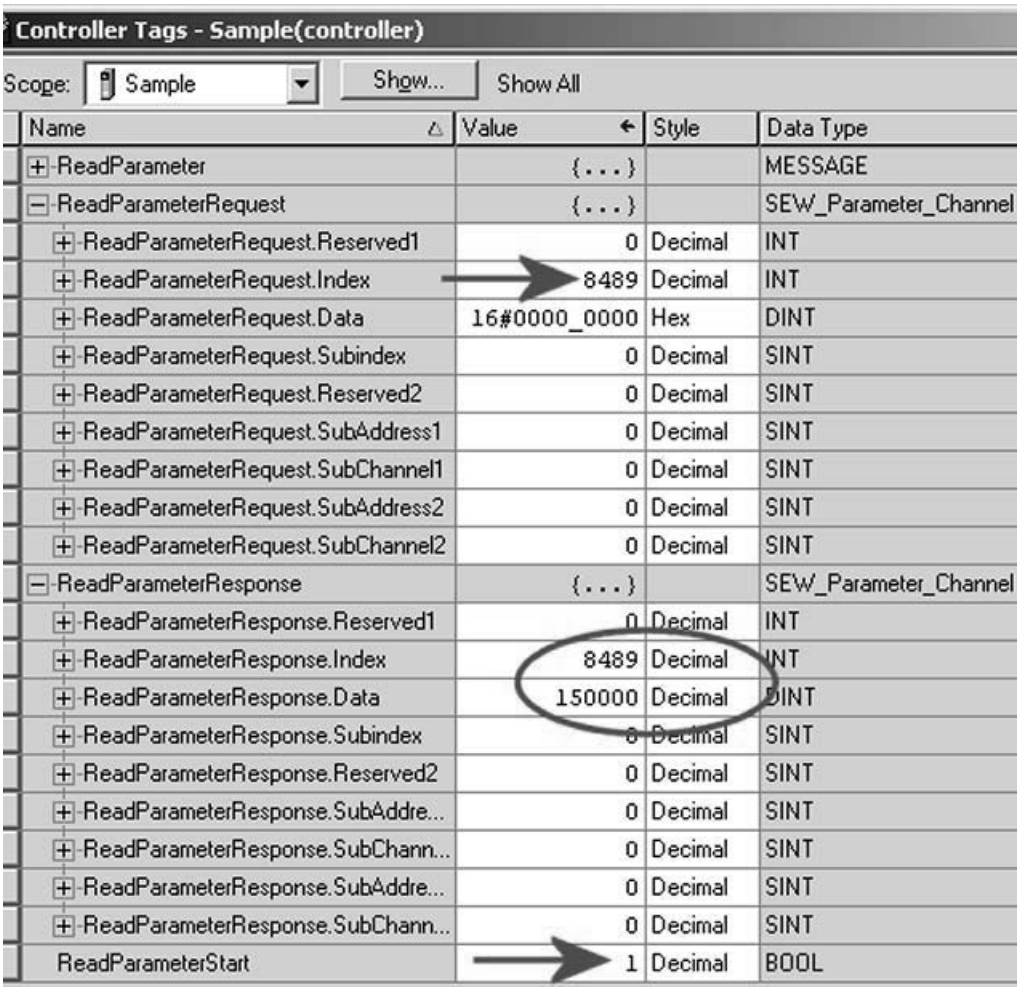


11768AXX

The path consists of:

- Name of the scanner (e. g. DNet_Scanner)
- 2 (always 2)
- Slave address (e. g. 11 bit)

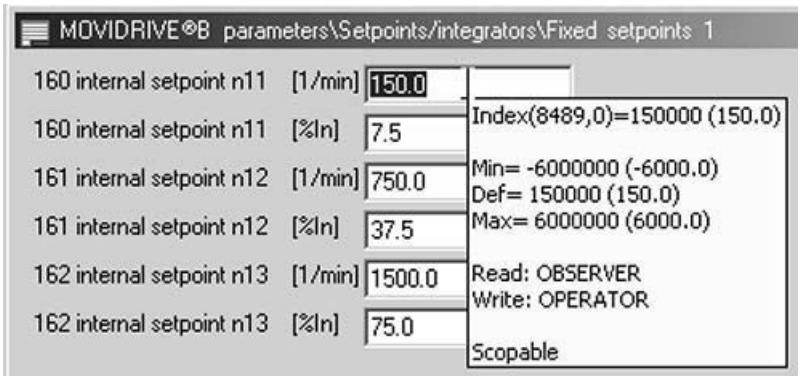
6. After downloading the changes to the PLC, the index of the parameter to be read can be entered at *ReadParameterRequest.Index*. By altering *ReadParameterStart* to '1' the read request is executed once (→ following figure).



11769AXX

On response to the read request, *ReadParameterResponse.Index* should indicate the read index and *ReadParameterResponse.Data* should contain the read data. In this sample *P160 internal setpoint n11* (Index 8489) has the value of 150 rpm.

In the MOVITOOLS® MotionStudio parameter tree, the value can be checked. The tooltip of a parameter displays e. g. index, subindex, scaling ... of a parameter.


MOVIDRIVE®B parameters\Setpoints/integrators\Fixed setpoints 1
160 internal setpoint n11 [1/min] 150.0
160 internal setpoint n11 [%In] 7.5
161 internal setpoint n12 [1/min] 750.0
161 internal setpoint n12 [%In] 37.5
162 internal setpoint n13 [1/min] 1500.0
162 internal setpoint n13 [%In] 75.0
Index(8489,0)=150000 (150.0)
Min= -6000000 (-6000.0)
Def= 150000 (150.0)
Max= 6000000 (6000.0)
Read: OBSERVER
Write: OPERATOR
Scopable

11770AXX

The complete list of index numbers and scaling factors can be taken from MOVIDRIVE® Fieldbus Unit Profile manual.

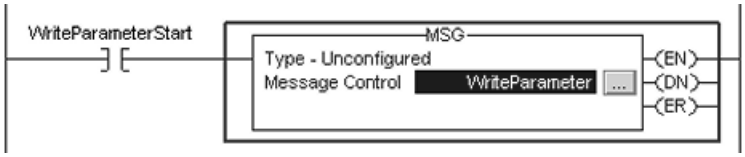
Only few changes are required for parameter write access:

- Define the controller tags (→ following figure).

Name	Data Type
⊞-WriteParameter	MESSAGE
⊞-WriteParameterRequest	SEW_Parameter_Channel
⊞-WriteParameterResponse	SEW_Parameter_Channel
WriteParameterStart	BOOL

11771AXX

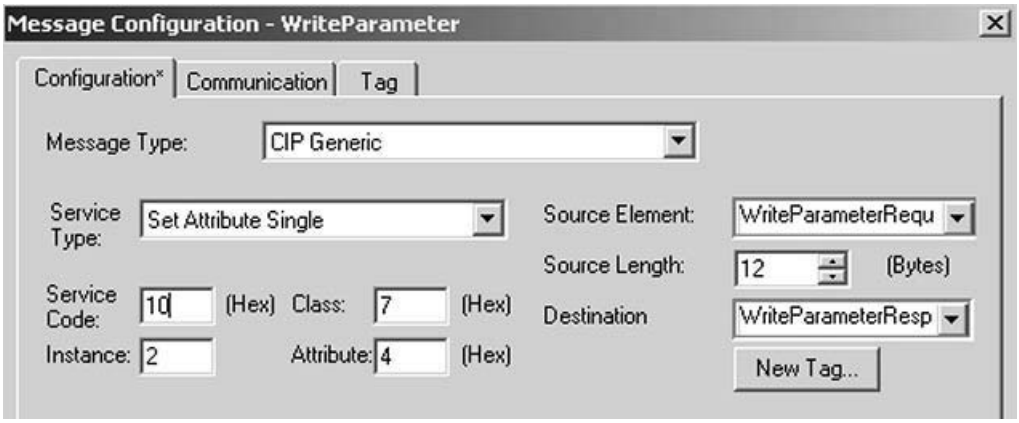
- Create a rung for the WriteParameter execution (→ following figure).



11772AXX

For contact, select the tag 'WriteParameterStart'
For the Message Control, select the tag 'WriteParameter'

- Click on [...] in the MSG instruction to open the Message Configuration Window (→ following figure).

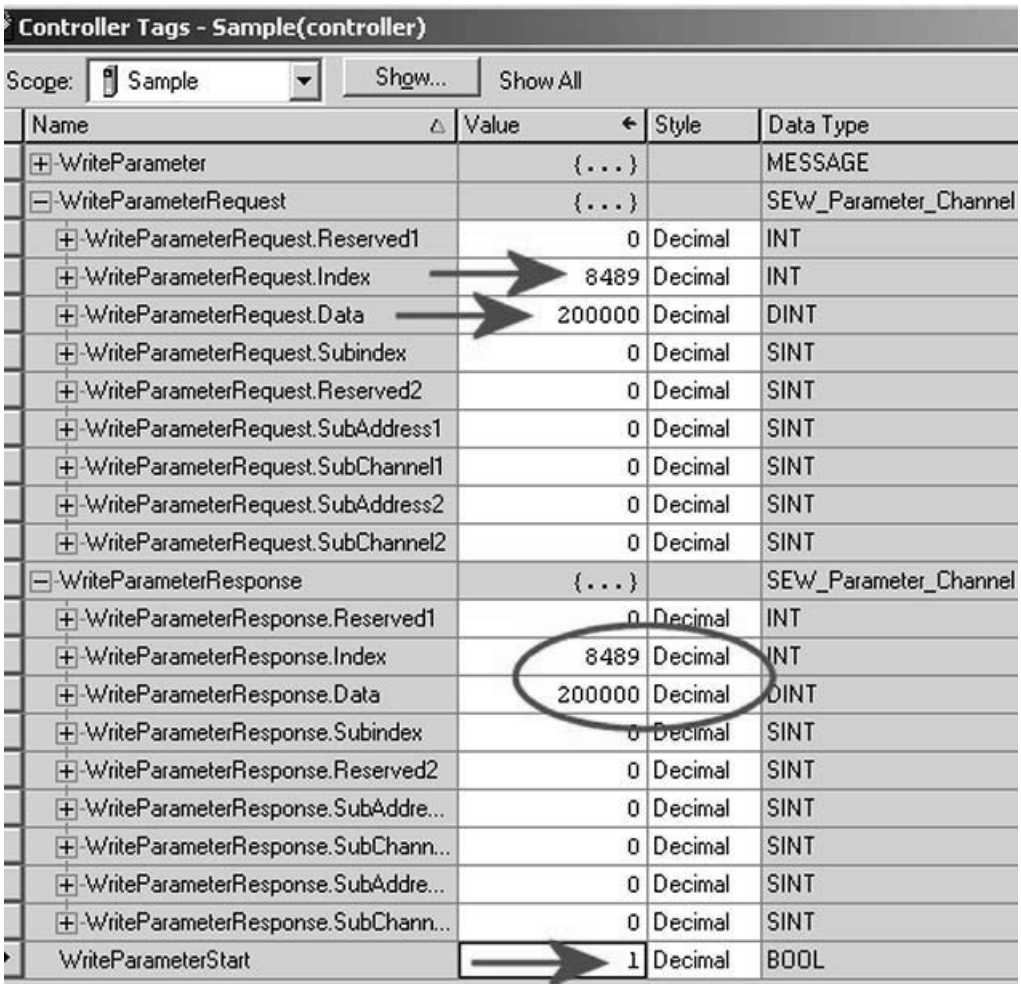


11773AXX

Fill in the data in the following order:

- Source Element = WriteParameterRequest.Index
- Source Length = 12
- Destination = WriteParameterResponse.Index
- Class = 7_{hex}
- Instance = 2
- Attribute = 4_{hex}
- Service Code = 10_{hex}

7. After downloading the changes to the PLC, index and value to be written into the parameter can be entered at *WriteParameterRequest.Index* and *WriteParameterRequest.Data.* By altering *WriteParameterStart* to '1' the write request is executed once (→ following figure).



11774AXX

On response to the write request, *WriteParameterResponse.Index* should give the written index and *WriteParameterResponse.Data* should contain the written data. In this sample *P160 internal setpoint n11* (Index 8489) has the value of 200 rpm.

In the MOVITOOLS® MotionStudio parameter tree, the value can be checked. The tooltip of a parameter displays e. g. index, subindex, scaling ... of a parameter.

5.5.4 MOVITRAC® B parameter access via DFD11B / UOH11B

The access to MOVITRAC® B parameter data via DeviceNet-SBus Gateway DFD11B/UOH11B is identical to the access to MOVIDRIVE® B parameter data (→ chapter 5.5.3).

The only difference is, that **Read/WriteParameterRequest.SubChannel1** is to be set to **2** and **Read/WriteParameterRequest.SubAddress1** is to be set to the **SBus address** of the MOVITRAC® B connected to the DFD11B/UOH11B (→ following figure).

Controller Tags - Sample(controller)

Scope: Sample | Show... | Show All

Name	Value	Style	Data Type
ReadParameter	{...}		MESSAGE
ReadParameterRequest	{...}		SEW_Parameter_Channel
ReadParameterRequest.Reserved1	0	Decimal	INT
ReadParameterRequest.Index	8489	Decimal	INT
ReadParameterRequest.Data	16#0000_0000	Hex	DINT
ReadParameterRequest.Subindex	0	Decimal	SINT
ReadParameterRequest.Reserved2	0	Decimal	SINT
ReadParameterRequest.SubAddress1	7	Decimal	SINT
ReadParameterRequest.SubChannel1	2	Decimal	SINT
ReadParameterRequest.SubAddress2	0	Decimal	SINT
ReadParameterRequest.SubChannel2	0	Decimal	SINT
ReadParameterResponse	{...}		SEW_Parameter_Channel
ReadParameterResponse.Reserved1	0	Decimal	INT
ReadParameterResponse.Index	8489	Decimal	INT
ReadParameterResponse.Data	150000	Decimal	DINT
ReadParameterResponse.Subindex	0	Decimal	SINT
ReadParameterResponse.Reserved2	0	Decimal	SINT
ReadParameterResponse.SubAddress1	7	Decimal	SINT
ReadParameterResponse.SubChannel1	2	Decimal	SINT
ReadParameterResponse.SubAddress2	0	Decimal	SINT
ReadParameterResponse.SubChannel2	0	Decimal	SINT
ReadParameterStart	1	Decimal	BOOL

11775AXX

In this sample, MOVITRAC® B connected to the DFD11B-Gateway with SBus address 7 read the value 150 rpm from *P160 Internal Setpoint n11* (Index 8489).

5.6 Programming samples in RSLogix 500 for SLC 500

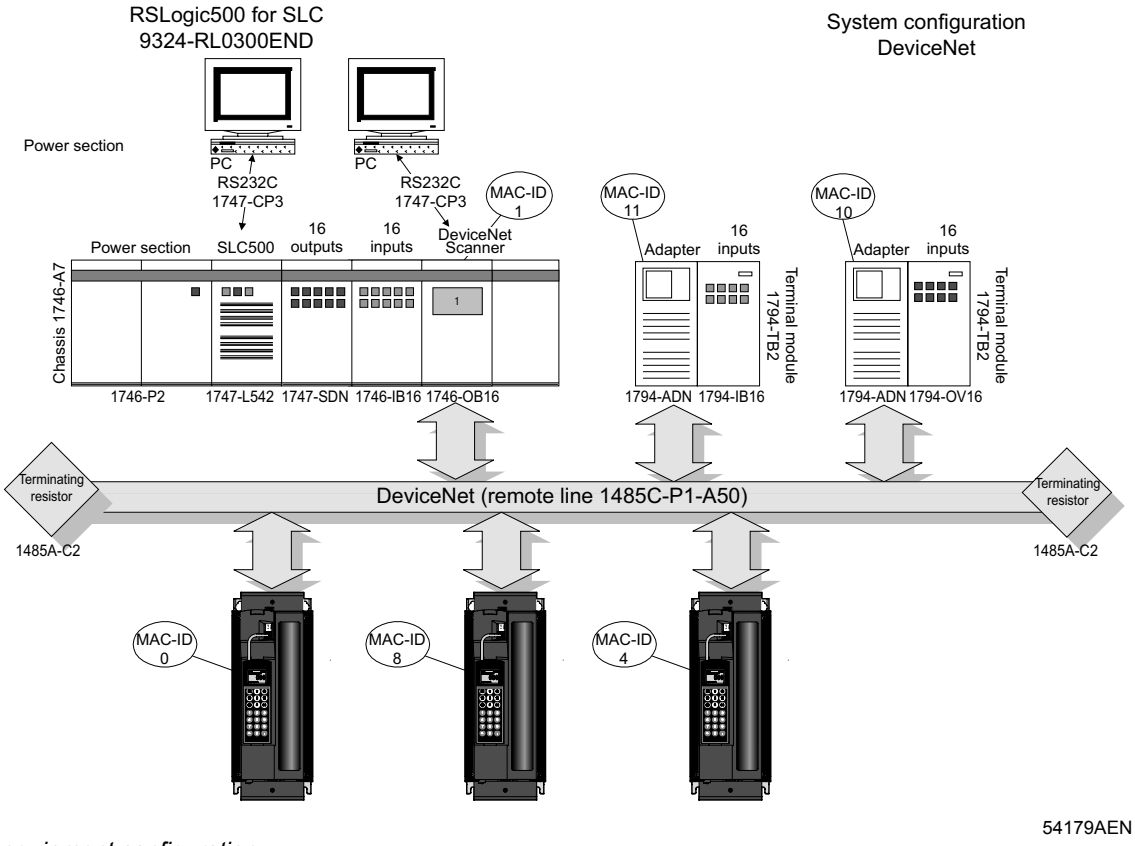


Figure 1: PLC equipment configuration

The following devices are used:

Unit	MAC-ID
SLC5/04	-
DeviceNet scanner 1747-SDN	1
INPUT module with 32 inputs	-
OUTPUT module with 32 outputs	-
DeviceNet adapter with input module with 16 inputs	11
DeviceNet with output module 16 outputs	10
MOVIDRIVE® MDX61B with DFD11B	8
MOVIDRIVE® MDX61B with DFD11B	0
MOVIDRIVE® MDX61B with DFD11B	4

The following memory areas have been specified with the DeviceNet manager software:

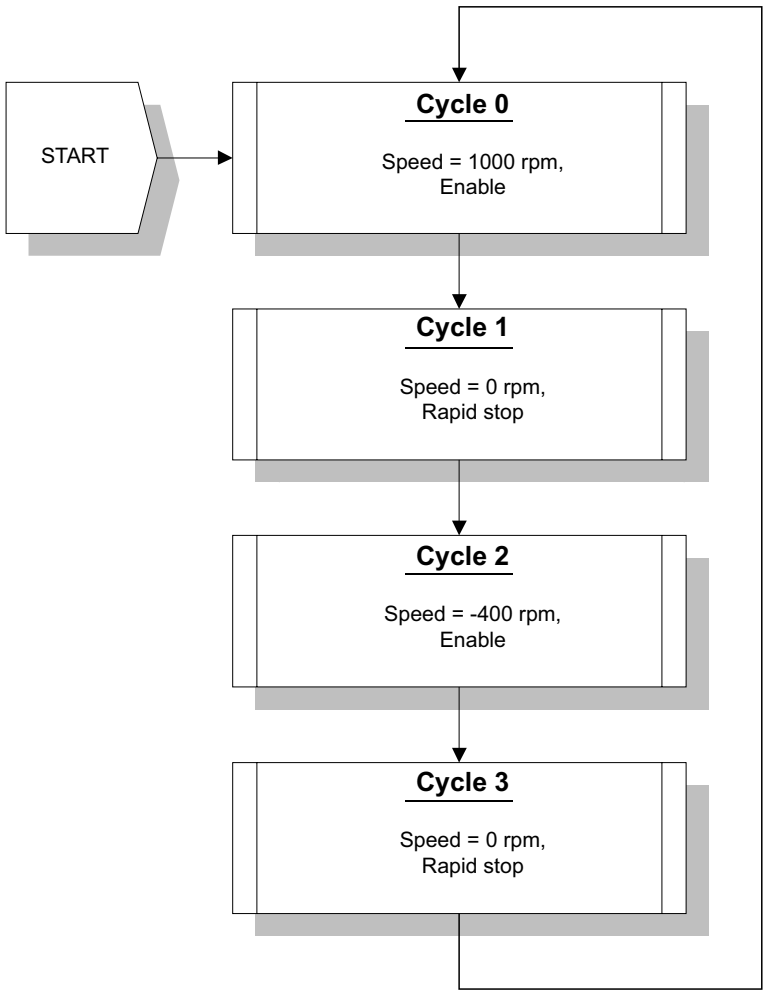
```
*********************************************************************
1747-SDN Scanlist Map
*********************************************************************
Discrete Input Map:
          15  14  13  12  11  10  09  08  07  06  05  04  03  02  01  00

I:3.000   R   R   R   R   R   R   R   R   R   R   R   R   R   R   R   R   Status word of the scanner
I:3.001   11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  Process data from device 11
I:3.002   11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  Process data from device 11
I:3.003   10  10  10  10  10  10  10  10  10  10  10  10  10  10  10  10  Process data from device 10
I:3.004   10  10  10  10  10  10  10  10  10  10  10  10  10  10  10  10  Process data from device 10
I:3.005   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  PID1 device 8 Polled I/O
I:3.006   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  PID2 device 8 Polled I/O
I:3.007   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  PID3 device 8 Polled I/O
I:3.008   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  PID1 device 8 Bit-Strobe I/O
I:3.009   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  PID2 device 8 Bit-Strobe I/O
I:3.010   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  PID3 device 8 Bit-Strobe I/O
I:3.011   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  PID1 device 0 Polled I/O
I:3.012   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  PID2 device 0 Polled I/O
I:3.013   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  PID3 device 0 Polled I/O
I:3.014   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  PID1 device 0 Bit-Strobe I/O
I:3.015   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  PID2 device 0 Bit-Strobe I/O
I:3.016   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  PID3 device 0 Bit-Strobe I/O
I:3.017   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  PID1 device 4 Polled I/O
I:3.018   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  PID2 device 4 Polled I/O
I:3.019   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  PID3 device 4 Polled I/O
I:3.020   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  PID1 device 4 Bit-Strobe I/O
I:3.021   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  PID2 device 4 Bit-Strobe I/O
I:3.022   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  PID3 device 4 Bit-Strobe I/O

Discrete Output Map:
          15  14  13  12  11  10  09  08  07  06  05  04  03  02  01  00

O:3.000   R   R   R   R   R   R   R   R   R   R   R   R   R   R   R   R   Control word of the scanner
O:3.001   11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  11  Process data to device 11
O:3.002   10  10  10  10  10  10  10  10  10  10  10  10  10  10  10  10  Process data to device 10
O:3.003   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  POD1 device 8 Polled I/O
O:3.004   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  POD2 device 8 Polled I/O
O:3.005   08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  08  POD3 device 8 Polled I/O
O:3.006   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  POD1 device 0 Polled I/O
O:3.007   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  POD2 device 0 Polled I/O
O:3.008   00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  00  POD3 device 0 Polled I/O
O:3.009   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  POD1 device 4 Polled I/O
O:3.010   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  POD2 device 4 Polled I/O
O:3.011   04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  04  POD3 device 4 Polled I/O
O:3.012   ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  ..  Bit-Strobe for device 8
```

The **Bit-Strobe data** are contrasted to the Polled I/O data **in bold.**

5.6.1 Exchange of polled I/O (process data) with MOVIDRIVE® B

Task

In the following program, process data are to be sent to a MOVIDRIVE® MDX61B and the motor should run at a different speed. The program sequence is shown in the following figure.

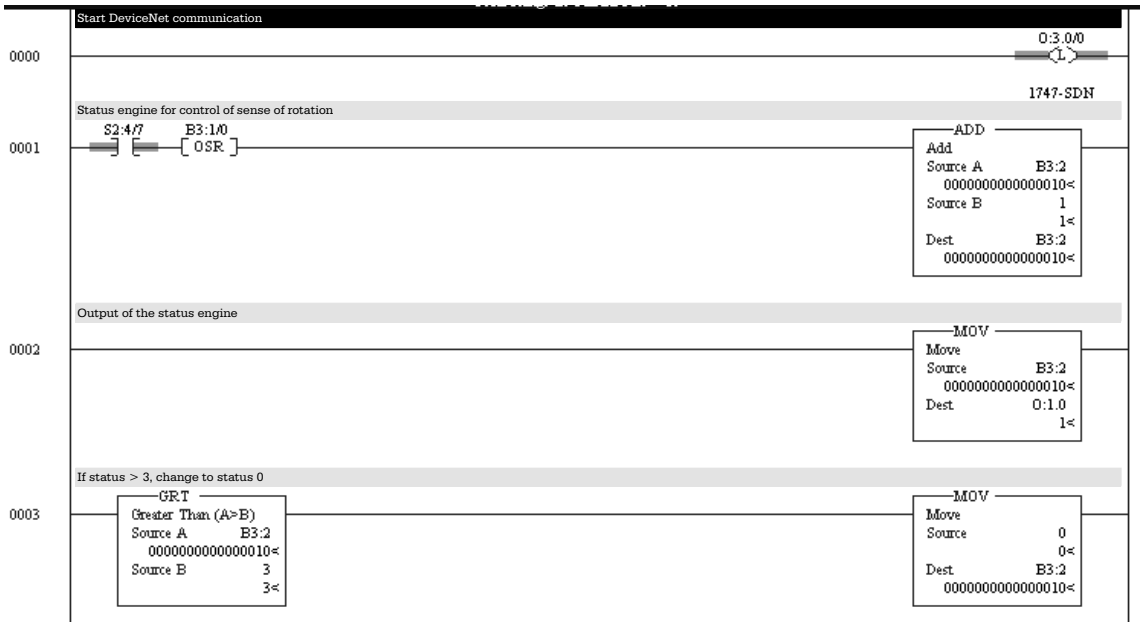


54178AEN

The parameters listed in the following table must be set in the MOVIDRIVE® MDX61B drive inverter for exchange of the process data.

Menu no.	Index	Parameter	Value
100	8461	Setpoint source	Fieldbus
101	8462	Control signal source	Fieldbus
870	8304	Process output data description 1	Control word 1
871	8305	Process output data description 2	Speed
872	8306	Process output data description 3	No function
873	8307	Process output data description 1	Status word 1
874	8308	Process output data description 2	Speed
875	8309	Process output data description 3	No function
876	8622	PO data enable	YES

MOVIDRIVE® MDX61B now works in fieldbus mode and can receive process data. The program can now be written for the SLC500.

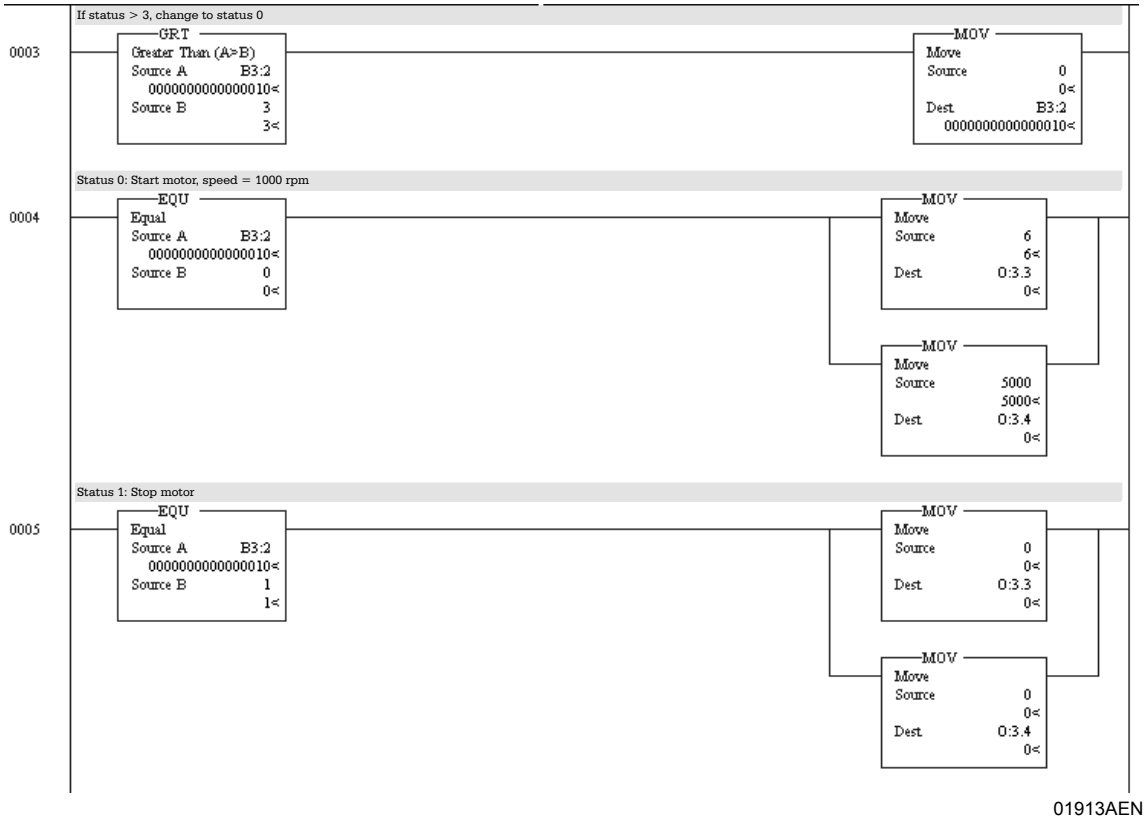


01912AEN

Output bit O:3.0/0 is set in rung 0 (program line 0), thereby starting DeviceNet communication (→ description of the DeviceNet scanner).

Rungs 1 and 3 implement the status engine with which states 0... 3 are implemented. The current status is written to the outputs O:1.0 of the output module of the SLC500 in rung 2.

The process data values are output to the scanner memory area in the following figure.



01913AEN

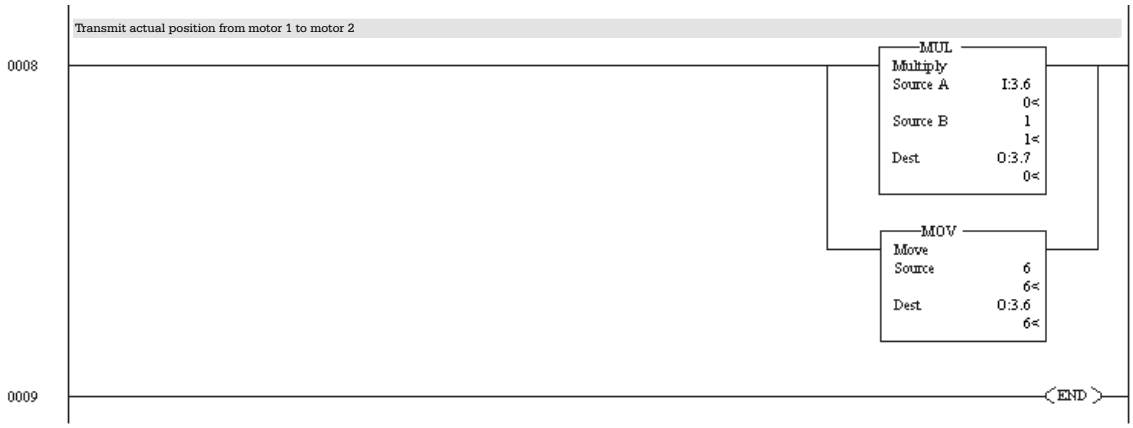
Status 0 is created in rung 4. In this status, a 6 (ENABLE) is written to memory area

O:3.3 that represents process output data word 1. A 5000 is written to memory area O:3.4 (process output data word 2), which represents 1000 rpm.

Status 1 is created in rung 5. In this status, a 0 (RAPID STOP) is written to memory area O:3.3 that represents process output data word 1. A 0 is written to memory area O:3.4 (process output data word 2), which represents the value 0 rpm. This means the motor is stopped with the rapid stop. States 2 and 3 are treated similarly to states 0 and 1, and are thus not explained any further.

In the figure above, the current actual value of the device with address 8, which is located in memory area I:3.6 (process input data word 2), is multiplied by a constant factor (in this case, by 1) and written to output memory area O:3.7 (process output data word 2 of the device with address 0).

In addition, the value 6 (ENABLE) is written to the process output data word 1 of the device with address 0 (O:3.6). Thus, the device with address 0 follows the actual speed with enable signal from the device with address 8.



01914AEN

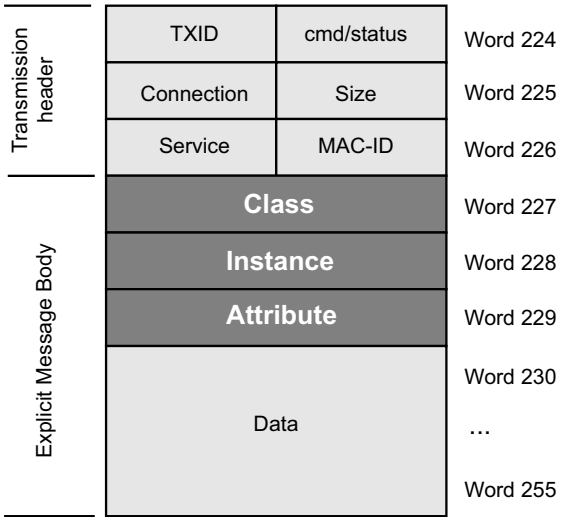
5.6.2 Exchanging explicit messages (parameter data) with MOVIDRIVE® B

Task

In this program, parameter data are exchanged between the control and the inverter.

Exchange of parameter data between inverter and SLC500 takes place via *M-Files* (→ Installation instructions on DeviceNet scanner module).

A memory area from word 224 to 255 in these *M-Files* is reserved for the explicit messages. The structure of this memory area is shown in the following figure.



54172AEN

This memory area is split up into two areas:

- Transmission header (three words)
- Explicit message body

The memory areas in the M-Files are described in more detail in the following overview.

Memory area	Function	Length	Value	Description
Transmission header	cmd/status	1/2 word each	→ following table	cmd: Entry of command code status: Entry of transmission status
	TXID		1 ... 255	During creation or downloading of a request to the scanner, the contact plan program of the SLC5 processor assigns a TXID to the transfer.
	Size		3 ... 29	Size of the explicit message body (in bytes!)
	Connection		0	DeviceNet connection (= 0)
	Service		$0E_{hex}$ 10_{hex} 05_{hex} etc.	Get_Attribute_Single (Read) Set_Attribute_Single (Write) Reset see DeviceNet specification for more services
Explicit message body	Class	1 word each	0 ... 255	DeviceNet class
	Instance			DeviceNet instance
	Attributes			DeviceNet attribute
	Data	0 ... 26 words	0 ... 65535	Data content

The following overviews offer a description of the command and status codes.

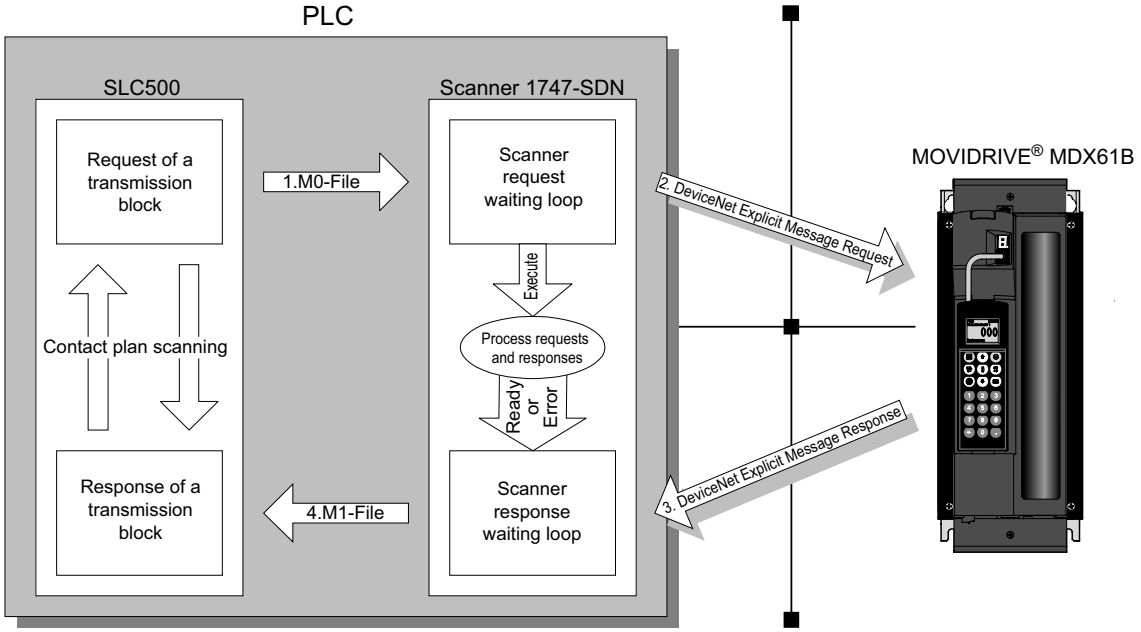
Command codes:

Command code (cmd)	Description
0	Ignore transmission block
1	Execute transmission block
2	Receive transmission status
3	Reset all client/server transmissions
4	Delete transmission from queue
5 ... 255	Reserved

Status codes:

Network node status	Description
0	Ignore transmission block
1	Transmission completed successfully
2	Transmission in progress
3	Error – Slave device not in the scan list
4	Error – Slave is off-line
5	Error – DeviceNet network connection deactivated (off-line)
6	Error – Unknown transmission TXID
7	Not used
8	Error – Invalid command code
9	Error – Scanner buffer full
10	Error – Other client/server transmission in progress
11	Error – No connection to slave device
12	Error – Response data are too long for the block
13	Error – Invalid connection
14	Error – Invalid size specified
15	Error – Busy
16 ... 255	Reserved

The M files are divided into a request file (M0 file) and a response file (M1 file). Data transmission takes place as shown in the following figure.



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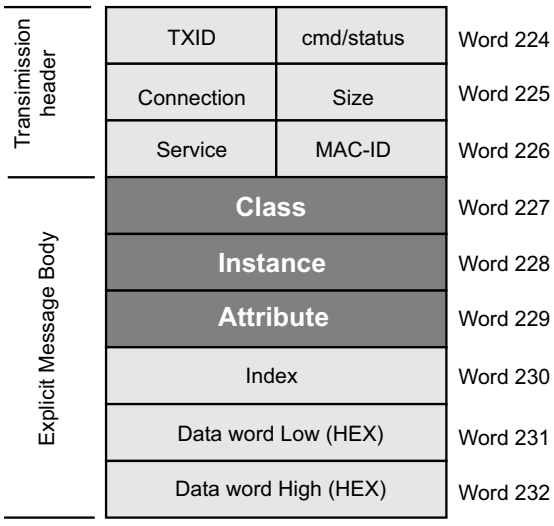
Register object class (7_{hex}) must be used in order to read (instance 1 to 9) or write (instance 2 and 3) parameters from the inverter via the SEW parameter data channel. The data range is divided into the index (1 word) and the parameter data (2 words).



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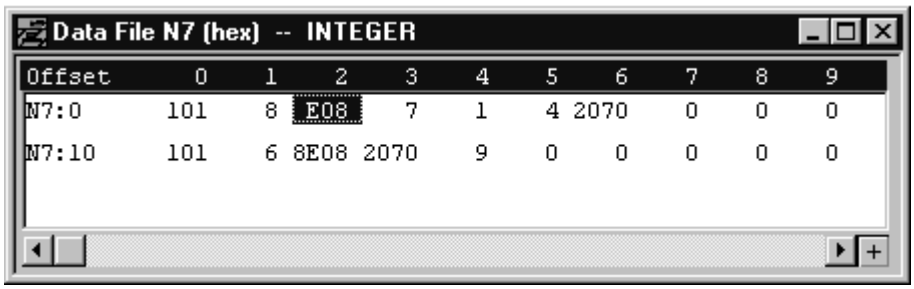
In the sample program, a data area is reserved in the integer file (N-File, following figure), into which the data of the M0/M1 files are written.



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The data telegram to be used is written in N7:0 to N7:8. N7:10 to N7:15 hold the data that are to be received.

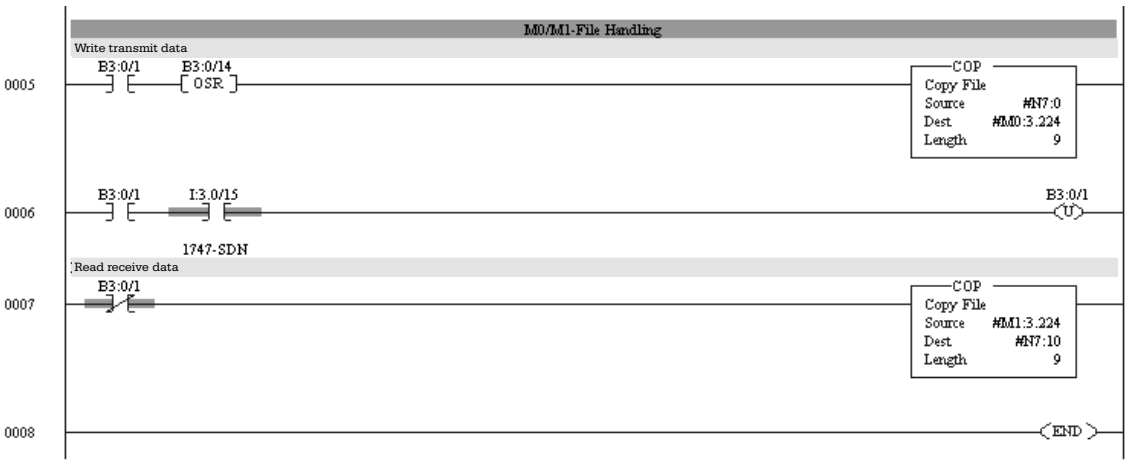
Word length	Request	
	Function	**Value**
1	TXID	1
	Cmd	1 = Start
2	Connection	0
	Size	8
3	Service	E_{hex} = Read Request
	MAC_ID	8
4	Class	7
5	Instance	1
6	Attributes	4
7	Data 1	2070_{hex}
8	Data 2	0_{hex}
9	Data 3	0

Word length	Response	
	Function	**Value**
1	TXID	1
	Status	1 = Successful
2	Connection	0
	Size	6
3	Service	8_{hex} = Read Response
	MAC_ID	8
4	Data 1	2070_{hex}
5	Data 2	9_{hex}
6	Data 3	0

The SEW parameter data channel can be addressed via Class 7, Instance 1 ... 9 and Attribute 4 (? Statement of Conformance).

In rung 5, the 9 bytes starting from N7:0 are copied into the M0-file with a rising edge of bit B3:0/1. This starts the reading of parameter 8304 (2070_{hex}). In rung 6, the system waits for the rising edge of scanner bit I:3.0/15. I:3.0/15 shows that the data are present. Request profile B3:0/1 can then be reset.

At this point, the received data still have to be written into the N-file. To this end, nine words of the M1-files N7:10...19 are written.



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6 DeviceNet Characteristics

6.1 Process data exchange

Polled I/O

The polled I/O messages correspond to the process data telegrams of the SEW fieldbus profile. Up to 10 process data words (for operation with MOVIDRIVE® B) or up to 24 process data words (for Gateway operation) can be exchanged between the control and DFD11B. The process data length is set via DIP switches S2-PD0 ... S2-PD4.

	NOTE
	The set process data length influences the process data lengths of both the polled I/O and the bit-strobe I/O messages. The process data length of the bit-strobe I/O messages can include up to four process data words. If the value for the process data length set via DIP switches is less than four, it will be accepted. If the value set via DIP switches is greater than four, the process data length will be automatically limited to four.

Timeout response with polled I/O

The timeout is triggered by the DFD11B option. The timeout interval must be set by the master after the connection has been established. The DeviceNet specification refers to an 'expected packet rate' rather than a timeout interval in this case. The expected packet rate is calculated on the basis of the timeout interval using the following formula:

$t_{Timeout\_inverter} = t_{Timeout\ interval\_Polled\_I/O} = 4 \times t_{Expected\_Packet\_Rate\_Polled\_I/O}$

The expected packet rate can be set using the connection object class 5, instance 2, attribute 9. The range of values runs from 0 ms to 65535 ms in 5 ms steps.

The expected packet rate for the polled I/O connection is converted into the timeout interval and displayed in the device and the timeout interval in parameter P819.

This timeout interval is retained in the device whenever the polled I/O connection is dropped, and the device switches to timeout status after the timeout interval has elapsed.

The timeout interval must not be altered in the inverter using MOVITOOLS® or the DBG60B keypad, because it can only be activated via the bus.

If a timeout occurs for the polled I/O messages, this connection type enters timeout status. Incoming polled I/O messages are no longer accepted.

The timeout causes the timeout reaction set in the inverter to be carried out.

The timeout can be reset with DeviceNet by means of the reset service of the connection object (class 0x05, instance 0x02, undetermined attribute), by disconnecting the connection, by means of the reset service of the identity object (class 0x01, instance 0x01, undetermined attribute) or with the reset bit in the control word.

Bit-strobe I/O

Bit-strobe I/O messages are not contained in the SEW fieldbus profile. The messages represent a DeviceNet-specific process data exchange. The master sends a broadcast message that is 8 bytes (= 64 bits) long. One bit in this message is assigned to each station in accordance with its address. The value of this bit may be 0 or 1, triggering two different responses in the recipient.

Bit value	Meaning	BIO LED
0	Sends back process input data only	Green light
1	Trigger fieldbus timeout reaction and send back process input data	Green light

	STOP!
	The BIO LED on the front of the DFD11B option can be used for distinguishing between the timeout triggered by the bit-strobe telegram and a real timeout in the connection. It remains continuously green if the timeout is triggered by the bit-strobe telegram. If the BIO LED flashes red, this means there is a timeout in the bit-strobe connection and no more bit-strobe telegrams are accepted. Each participant that has received this bit-strobe I/O message responds with its current process input data. The length of the process input data corresponds to the process data length for the polled I/O connection. The process input data length can be up to four process data.

The following table shows the data range of the bit-strobe request message which represents the allocation of stations (= station address) to data bits.

Example: For example, the participant with station address (MAC-ID) 16 only processes bit 0 in data byte 2.

Byte offset	7	6	5	4	3	2	1	0
0	ID 7	ID 6	ID 5	ID 4	ID 3	ID 2	ID 1	ID 0
1	ID 15	ID 14	ID 13	ID 12	ID 11	ID 10	ID 9	ID 8
2	ID 23	ID 22	ID 21	ID 20	ID 19	ID 18	ID 17	ID 16
3	ID 31	ID 30	ID 29	ID 28	ID 27	ID 26	ID 25	ID 24
4	ID 39	ID 38	ID 37	ID 36	ID 35	ID 34	ID 33	ID 32
5	ID 47	ID 46	ID 45	ID 44	ID 43	ID 42	ID 41	ID 40
6	ID 55	ID 54	ID 53	ID 52	ID 51	ID 50	ID 49	ID 48
7	ID 63	ID 62	ID 61	ID 60	ID 59	ID 58	ID 57	ID 56

Timeout response with bit-strobe I/O

The timeout is triggered by the DFD11B option. The timeout interval must be set by the master after the connection has been established. The DeviceNet specification refers to an 'expected packet rate' rather than a timeout interval in this case. The expected packet rate is calculated on the basis of the timeout interval using the following formula:

$$t_{Timeout\_BitStrobe\_I/O} = 4 \times t_{Expected\_Packet\_Rate\_BitStrobe\_I/O}$$

It can be set using connection object class 5, instance 3, attribute 9. The range of values runs from 0 ms to 65535 ms in 5 ms steps.

If a timeout occurs for the bit-strobe I/O messages, this connection type enters timeout status. Incoming bit-strobe I/O messages are no longer accepted. The timeout is not forwarded to the inverter.

The timeout reset takes place as follows:

- via DeviceNet with the reset service of the connection object (class 0x05, instance 0x03, undetermined attribute)
- by interrupting the connection
- via reset service of the identity object (class 0x01, instance 0x01, undetermined attribute)

6.2 The Common Industrial Protocol (CIP)

DeviceNet is integrated into the Common Industrial Protocol (CIP).

In the Common Industrial Protocol, all unit data can be accessed via objects. The objects listed in the following table are integrated in the DFD11B option.

Class [hex]	Name
01	Identify Object
03	DeviceNet Object
05	Connection Object
07	Register Object
0F	Parameter Object

6.2.1 CIP object directory

Identity object

- The identity object contains general information on the EtherNet/IP device.
- Class code: 01_{hex}

Class

None of the class attributes are supported.

Instance 1

Attribute	Acc.	Name	Data type	Default value [hex]	Description
1	Get	Vendor ID	UINT	013B	SEW-EURODRIVE GmbH & Co KG
2	Get	Device Type	UINT	0064	Manufacturer-specific type
3	Get	Product Code[1)]	UINT	000A 000E	Product No.10: DFD11B for MDX B Product No.14: DFD11B as Gateway
4	Get	Revision	STRUCT of		Revision of the identity object, depends on firmware version
		Major Revision	USINT		
		Minor Revision	USINT		
5	Get	Status	WORD		→ Table "Coding of attribute 5 Status
6	Get	Serial Number	UDINT		Unique serial number
7	Get	Product Name[1)]	SHORT_STRING	SEW MOVIDRIVE DFD11B SEW GATEWAY DFD11B	Product name

1) Some values in Identity object depend on the device DFD11B is mounted in MOVIDRIVE® B or Gateway.

- Coding of attribute 5 "Status":

Bit	Name	Description
0	Owned	Controlling connection is active
1	-	Reserved
2	Configured	Configuration complete
3	-	Reserved
4 ... 7	Extended Device Status	→ Table "Coding of the extended device status"
8	Minor Recoverable Fault	Minor fault that can be remedied
9	Minor Unrecoverable Fault	Minor fault that cannot be remedied
10	Major Recoverable Fault	Major fault that cannot be remedied
11	Major Unrecoverable Fault	Major fault that cannot be remedied
12 ... 15	-	Reserved

- Coding of the "extended device status " (Bit 4 ... 7):

Value [binary]	Description
0000	Unknown
0010	At least one faulty I/O connection
0101	No I/O connection established
0110	At least one I/O connection active

Supported services

Service Code [hex]	Service Name	Instance
05	Reset	X
0E	Get_Attribute_Single	X

DeviceNet object

- The DeviceNet object provides information on the DeviceNet communication interface.
- Class code: 03_{hex}

Class

Attribute	Acc.	Name	Data type	Default value [hex]	Description
1	Get	Revision	UINT	0002	Revision 2

Instance 1

Attribute	Acc.	Name	Description
1	Get	MAC-ID	According to DIP-switches (0 ... 63)
2	Get	Baud rate	According to DIP-switches (0 ... 2)
3	Get	BOI	
4	Get/Set	Bus-off Counter	Error counter of the physical CAN-Interface (0 ... 255)
5	Get	Allocation information	
6	Get	MAC-ID switch changed	Information as to whether DIP switch settings vary from MAC-ID
7	Get	Baud rate switch changed	Information as to whether DIP switch settings vary from baud rate
8	Get	MAC-ID switch value	Actual DIP switch settings for MAC-ID
9	Get	Baud rate switch value	Actual DIP switch settings for baud rate

Supported services

Service Code [hex]	Service Name	Class	Instance
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	-	X

Connection object

- In the connection object the process- and parameter connections are defined.
- Class code: 05_{hex}

Class

None of the class attributes are supported.

Instance	Communication
1	Explicit message
2	Polled I/O
3	Bit-Strobe I/O

Instance 1 ... 3

Attribute	Access	Name
1	Get	State
2	Get	Instance type
3	Get	Transport Class trigger
4	Get	Produce connection ID
5	Get	Consume connection ID
6	Get	Initial com characteristics
7	Get	Produced connection size
8	Get	Consumed connection size
9	Get/Set	Expected packet rate
12	Get	Watchdog time-out action
13	Get	Produced connection path len
14	Get	Produced connection path
15	Get	Consumed connection path len
16	Get	Consumed connection path
17	Get	Production inhibit time

Supported services

Service Code [hex]	Service Name	Instance
0x05	Reset	X
0x0E	Get_Attribute_Single	X
0x10	Set_Attribute_Single	X

Register object

- The register object is used to access an SEW parameter index.
- Class code: 07_{hex}

Class

None of the class attributes are supported.

The MOVILINK® parameter services are mapped in the nine instances of the register object. The services "Get_Attribute_Single" and "Set_Attribute_Single" are used for access.

As the register object is designed so that INPUT objects can only be read and OUTPUT objects can be read and written, the options listed in the following table are available for addressing the parameter channel.

Instance	INPUT OUTPUT	Resulting MOVILINK® service with	
		Get_Attribute_Single	Set_Attribute_Single
1	INPUT	READ parameters	Invalid
2	OUTPUT	READ	WRITE parameters
3	OUTPUT	READ	WRITE VOLATILE parameters
4	INPUT	READ MINIMUM	Invalid
5	INPUT	READ MAXIMUM	Invalid
6	INPUT	READ DEFAULT	Invalid
7	INPUT	READ SCALING	Invalid
8	INPUT	READ ATTRIBUTE	Invalid
9	INPUT	READ EEPROM	Invalid

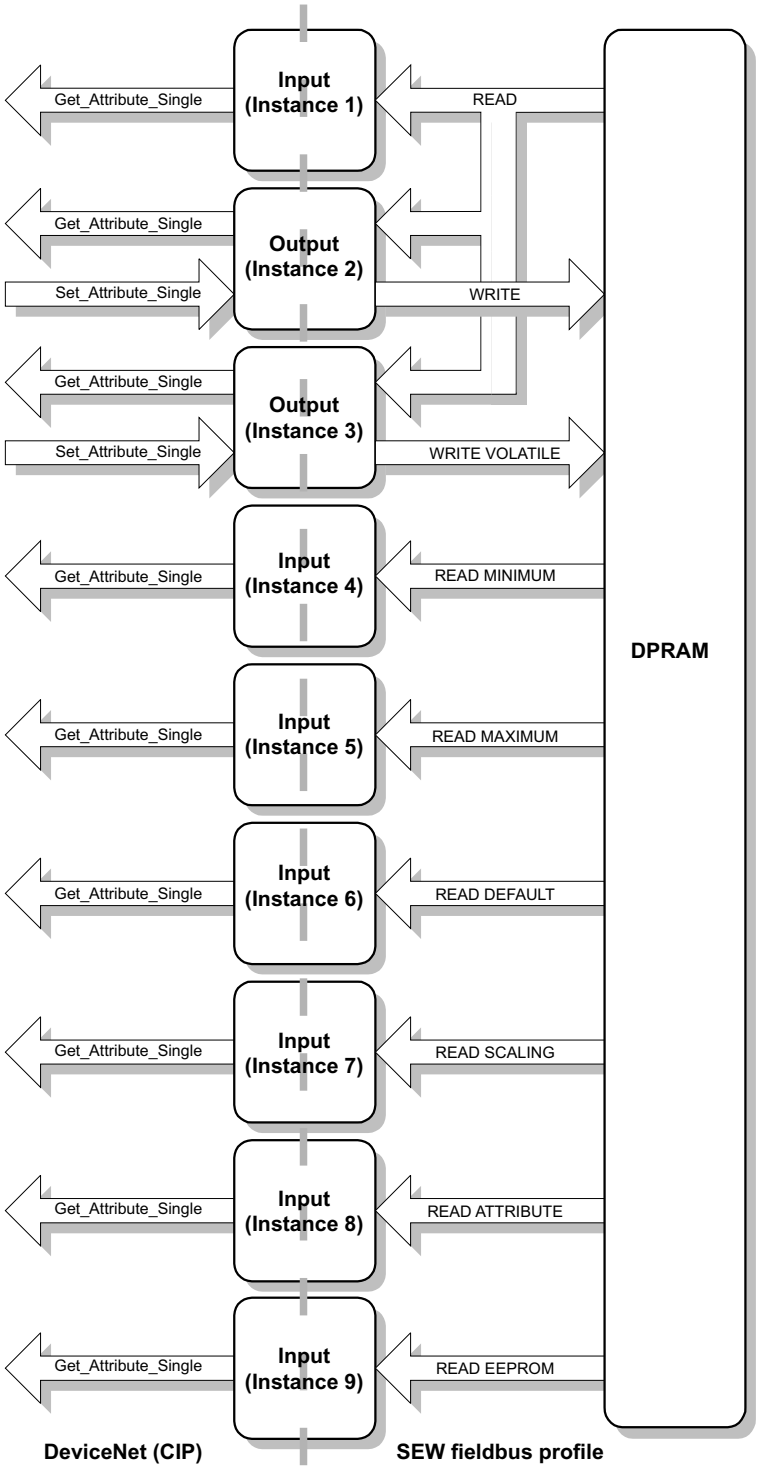

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Figure 2: Description of the parameter channel

Instance 1 ... 9

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Get	Bad Flag	BOOL	00	0 = good / 1 = bad
2	Get	Direction	BOOL	00 01	00 = Input register 01 = Output register
3	Get	Size	UINT	0060	Data length in bits (96 bits = 12 bytes)
4	Get/Set	Data	ARRAY of BITS		Data in format of the SEW parameter channel

NOTES

Explanation of the attributes:

- Attribute 1 indicates whether an error occurred during the previous access to the data field.
- Attribute 2 displays the direction of the instance.
- Attribute 3 indicates the data length in bits
- Attribute 4 represents the parameter data. When accessing attribute 4, the SEW parameter channel must be attached to the service telegram. The SEW parameter channel consists of the elements listed in the following table.
- In order to offer full compatibility to older drives and applications, the parameter channel can be reduced to 6 Byte (Index and data).

Name	Data type	Description		
Index	UINT	SEW parameter index		
Data	UDINT	Data (32 bit)		
Subindex	BYTE	SEW unit subindex		
Reserved	BYTE	Reserved (must be '0')		
Subaddress 1	BYTE	0 Parameter of MOVIDRIVE® B or gateway itself	1 ...63	SBus-address of drives connected to the SBus of the gateway
Subchannel 1	BYTE	0	2	SBus → Subchannel of the gateway
Subaddress 2	BYTE	Reserved (must be '0')		
Subchannel 2	BYTE	Reserved (must be '0')		

Supported services

Service Code [hex]	Service Name	Instance
0x0E	Get_Attribute_Single	X
0x10	Set_Attribute_Single	X

Parameter object (DFD11B in MOVIDRIVE® B)

- The fieldbus parameters of the MOVIDRIVE® B can be addressed directly via the instance with the parameter object.
- In exceptional cases, you can also use the parameter object to access SEW parameters.
- Class code: $0F_{hex}$

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
2	Get	Max Instance	UINT	0025	Maximum instance = 37
8	Get	Parameter Class Descriptor	UINT	0009	Bit 0: Supports parameter instances Bit 3: Parameters are saved permanently
9	Get	Configuration Assembly Interface	UINT	0000	Configuration assembly is not supported.

Instance 1 and 2 of the parameter object offer access to SEW parameters as follows:

- First, the index of the required parameter is set in instance 1.
- Next, instance 2 is used to access the parameter that is addressed in instance 1.

Access to an SEW parameter index via the parameter object is complicated and prone to errors. Consequently, this process should only be used when the DeviceNet scanner does not support configuration using the mechanisms of the register object.

Instance 1 - SEW parameter index

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Set	Parameter Value	UINT	206C	Index of the parameter
2	Get	Link Path Size	USINT	00	No link is specified.
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data Type	EPATH	00C7	UINT
6	Get	Data Size	USINT	02	Data length in bytes

Instance 2 - Data read/write

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Set	Parameter Value	UDINT		The set service executes write access to the parameters addressed in instance 1 The get service executes read access to the parameters addressed in instances 1
2	Get	Link Path Size	USINT	00	No link is specified.
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data Type	EPATH	00C8	UDINT
6	Get	Data Size	USINT	04	Data length in bytes

Instance 3 ... 37

Instances 3 ... 37 give access to the fieldbus parameters.

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Set/Get	Parameter	UINT		Parameter that is to be read or written see table fieldbus parameter MOVIDRIVE® B
2	Get	Link Path Size	USINT	00	No link is specified.
3	Get	Link Path	Packed EPATH	00	Not used
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data Type	EPATH	00C8	UDINT
6	Get	Data Size	USINT	04	Data length in bytes

Fieldbus parameters MOVIDRIVE® B

Instance	Access	Group	Name	Meaning
3	Get	Device parameters	Device identification	Part number device
4	Get/Set		Control source	Control signal source
5	Get/Set		Setpoint source	Setpoint source
6	Get		PD configuration	Process data configuration
7	Get/Set		Setp.descr.PO1	Process output data assignment for PD1
8	Get		Setp.descr.PO2	Process output data assignment for PD2
9	Get/Set		Setp.descr.PO3	Process output data assignment for PD3
10	Get		Act.v.descr. PI1	Process input data assignment for PD1
11	Get/Set		Act.v.descr. PI2	Process input data assignment for PD2
12	Get		Act.v.descr. PI3	Process input data assignment for PD3
13	Get/Set		PO Data Enable	Enable process data
14	Get		Timeout response	Timeout response
15	Get		Fieldbus type	Fieldbus type
16	Get		Baud rate	Baud rate via DIP switches
17	Get		Station address	MAC-ID via DIP switches
18 ... 27	Get	PO monitor	PO1 setpoint ... PO10 setpoint	Monitor of the Process output data words
28 ... 37	Get	PI monitor	PI1 actual value ... PI10 actual value	Monitor of the Process input data words

NOTE

The data format for these instances deviates from the SEW fieldbus profile to meet the DeviceNet specification.

Supported services

Service Code [hex]	Service Name	Class	Instance
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	-	X

Parameter object (DFD11B as gateway)

- The fieldbus parameters of the gateway can be addressed directly via the instance with the parameter object.
- Class code: $0F_{hex}$

Class

Attribute	Access	Name	Data type	Default value [hex]	Description
2	Get	Max Instance	UINT	0035	Maximum instance = 53
8	Get	Parameter Class Descriptor	UINT	0009	Bit 0: Supports parameter instances Bit 3: Parameters are saved permanently
9	Get	Configuration Assembly Interface	UINT	0000	Configuration assembly is not supported.

Instance 1 ... 53

Attribute	Access	Name	Data type	Default value [hex]	Description
1	Set/Get	Parameter Value	UINT	206C	Parameter that is to be read or written (see table fieldbus parameter gateway)
2	Get	Link Path Size	USINT	00	Not used here
3	Get	Link Path	Packed EPATH	00	Not used here
4	Get	Descriptor	WORD	0000	Read/write parameter
5	Get	Data Type	EPATH	00C8	UINT
6	Get	Data Size	USINT	04	Data length in bytes

Fieldbus parameters gateway

Instance	Access	Group	Name	Meaning
1	Get	Device parameters	PD configuration	Process data configuration
2	Get/Set		Timeout response	Timeout response
3	Get		Fieldbus type	DeviceNet
4	Get		Baud rate	Baud rate via DIP switches
5	Get		MAC-ID	MAC-ID via DIP switches
6 ... 29	Get	PO monitor	PO1 setpoint ... PO24 setpoint	Monitor of the Process output data words
30 ... 53	Get	PI monitor	PI1 actual value ... PI24 actual value	Monitor of the Process input data words

NOTE

The data format for these instances deviates from the SEW fieldbus profile to meet the DeviceNet specification.

Supported services

Service Code [hex]	Service Name	Class	Instance
0E	Get_Attribute_Single	X	X
10	Set_Attribute_Single	-	X

6.3 Return codes for parameter setting via explicit messages

SEW-specific return codes

The return codes which the inverter sends back in the event of incorrect parameter setting are described in the manual for the fieldbus device profile and do not form part of this documentation. However, the return codes are sent back in a different format in conjunction with DeviceNet. The following table shows the data format for a parameter response telegram.

	Byte offset			
	0	**1**	**2**	**3**
Function	MAC-ID	Service code [=94hex]	General error code	Additional code
Example	01_{hex}	94_{hex}	$1F_{hex}$	10_{hex}

- MAC-ID is the DeviceNet address
- The *Service code* of an error telegram is always $94h_{hex}$
- The *General Error Code* of an inverter-specific return code is always $1F_{hex}$ *= proprietary error*
- The additional code is identical to the *additional code* described in the *SEW fieldbus device profile manual.*

  The table shows the proprietary error 10_{hex} *= Illegal parameter index.*

Return codes from DeviceNet

DeviceNet-specific return codes are sent in the error message if the data format is not maintained during the transfer or if a service is performed which has not been implemented. The coding of these return codes is described in the DeviceNet specification (→ section "General Error Codes").

Timeout of explicit messages

The timeout is triggered by the DFD11B option. The timeout interval must be set by the master after the connection has been established. The DeviceNet specification refers to an 'expected packet rate' rather than a timeout interval in this case. The expected packet rate is calculated on the basis of the timeout interval using the following formula:

$$t_{Timeout\_ExplicitMessages} = 4 \times t_{Expected\_Packet\_Rate\_ExplicitMessages}$$

It can be set using connection object class 5, instance 1, attribute 9. The range of values runs from 0 ms to 65535 ms in 5 ms steps.

If a timeout is triggered for the explicit messages, this connection type for the explicit messages is automatically dropped provided that the polled I/O or bit-strobe connections are not in the ESTABLISHED state. This is the default setting of DeviceNet. The connection for explicit messages must be re-established to communicate through these messages again. The timeout is **not** forwarded to the inverter.

General error codes

DeviceNet-specific error codes

General error code (hex)	Error name	Description
00 - 01		Reserved for DeviceNet
02	Resource unavailable	The source required for performing the service is unavailable
03 - 07		Reserved for DeviceNet
08	Service not supported	The service is not supported for the selected class/instance
09	Invalid attribute value	Invalid attribute data have been sent
0A		Reserved for DeviceNet
0B	Already in requested mode/state	The selected object is already in the requested mode/state
0C	Object state conflict	The selected object cannot perform the service in its current status
0D		Reserved for DeviceNet
0E	Attribute not settable	It is not possible to access the selected object for writing.
0F	Pivilege violation	Violation of access entitlement
10	Device state conflict	The current status of the device makes it impossible to perform the required service
11	Reply data too large	The length of the transmitted data is longer than the size of the receive buffer
12		Reserved for DeviceNet
13	Not enough data	The length of the transferred data is too short for the service to be performed
14	Attribute not supported	The selected attribute is not supported
15	Too much data	The length of the transferred data is too long for the service to be performed
16	Object does not exist	The selected object is not implemented in the device
17		Reserved for DeviceNet
18	No stored attribute data	The requested data have not been stored previously
19	Store operation failure	The data could not be stored because an error occurred while saving them
1A - 1E		Reserved for DeviceNet
1F	Vendor specific error	Vendor specific error (→ Manual"SEW Fieldbus Device Profile")
20	Invalid parameter	Invalid parameter This error message is used when a parameter does not satisfy the requirements of the specification and/or the requirements of the application.
21 - CF	Future extensions	Reserved by DeviceNet for additional definitions
D0 - DF	Reserved for Object Class and service errors	Use this area if an occurring error cannot be entered in one of the error groups listed above.

6.4 Definitions of terminology

Term	Description
Allocate	Provides a service for setting up a connection.
Attributes	Attribute of an object class or instance. Describes the characteristics of the object class or instance in more detail.
BIO – Bit-Strobe I/O	All stations can be addressed with a broadcast telegram. The addressed stations respond with the process input data.
Class	DeviceNet object class
Device-Net scanner	Plug-in module for the Allen Bradley PLC which connects the PLC fieldbus to the peripheral devices.
DUP-MAC check	Duplicate MAC-ID test
Explicit message body	Includes the class no., instance no., attribute no. and the data.
Explicit message	Parameter data message; assists in addressing the DeviceNet objects.
Get_Attribute_Single	Read service for a parameter.
Instance	Instance of an object class. Divides the object classes into additional subgroups.
MAC-ID	Media Access Control Identifier: node address of the device.
M-File	Provides the data range between the PLC and the scanner module.
Mod/Net	Module/Network
Node ID	Node address = MAC-ID
PIO – Polled I/O	Process data channel of DeviceNet; allows process output data to be sent and process input data to be received.
Release	Provides a service for setting up a connection.
Reset	Provides a service for resetting an error.
Rung	SLC500 program line
Service	Service performed via bus, e.g. read service, write service, etc.
Set_Attribute_Single	Write service for a parameter.
SLC500	Allen Bradley PLC

7 Operating MOVITOOLS® MotionStudio via DeviceNet

At the moment it is not possible to run MOVITOOLS® MotionStudio via DeviceNet or via DeviceNet master to enable communication down to the drives. The access to single parameters by the PLC can be achieved via Explicit Messages (→ Chapter 6)

8 Error Diagnostics

8.1 Diagnostic procedures

The diagnostic procedures described in the following section demonstrate the fault analysis methods for the following problems:

- Inverter does not work on DeviceNet
- Inverter cannot be controlled using the DeviceNet master

For more information dealing specifically with the inverter parameter settings for various fieldbus applications, refer to the *Fieldbus Unit Profile manual and the MOVIDRIVE® parameter list*.

Step 1: Check the Status LED and the Status display of the DeviceNet scanner

See documentation of the DeviceNet scanner.

Step 2: Check the Status LEDs of the DFD11B

The explanation of the different LEDs can be found in chapter 4. The following table shows the corresponding unit states and their causes. An 'X' indicates that the state of the respective LED is not relevant.

LED				DFD11B	
MOD/NET	**PIO**	**BIO**	**BUS FAULT**	**Status**	**Cause**
Off	Off	Off	Off	Off	No power supply via MOVIDRIVE® B or X26 when mounted into MOVITRAC® B or gateway housing.
Off	Yellow	Off	Off	Booting	During bootup and synchronization to MOVIDRIVE® B.
Off	Flashing red	X	Off	Baud rate invalid	Invalid baud rate setting via DIP switches
Off	X	Flashing red	Off	No. PD invalid	Invalid number of process data words set via DIP switches
Off	Flashing green	Flashing green	Yellow	No power via X30	Power supply via X30 not connected / switched on
Off	Flashing green	Flashing green	Flashing red	Error passive	Wrong baud rate or no other DeviceNet node connected
Red	Red	Red	Off	DUP-MAC error	Address (MAC-ID) is assigned twice in the network
Flashing green	Off	Off	X	operational	DFD11B active on the bus but without connection to the master (scanner)
Flashing red	Flashing red	X	X	Timeout	Timeout of the PIO-connection to the master
Green	Green	X	X	Connected	DFD11B active on the bus with active PIO-connection to the master
Flashing red	Green	X	X	Module error	DFD11B with active PIO connection and active error of gateway (see LED H1) or MOVIDRIVE® B (see 7 segment display)

Step 3: Troubleshooting

When DFD11B is in status 'Connected' or 'Module error' the data exchange between master (scanner) and slave (DFD11B) is active. If it is still possible to run the drive via DeviceNet, the following questions should help to find the reason.

A Are the right values displayed for the process data words in MOVITOOLS® MotionStudio? Parameter group 09 (MOVIDRIVE® B) or process data (Gateway).

→ if yes, proceed with F.

B Is bit 0 in DeviceNet control register of the PLC set to '1' to activate the process data exchange?

C Are the process data words copied to the right offset in the Local I/O tag of the DeviceNet scanner? Check in controller tags and scanner mapping.

D Is the PLC in RUN mode or does active forcing overwrite the transfer of the normal process data words?

E If the PLC is not sending data to the DFD11B, please refer to the documentation of the PLC manufacturer for support.

F Is the DFD11B mounted into MOVITRAC® B or gateway housing?

→ if yes, proceed with H.

G In MOVIDRIVE® B, is *P100 control source* and *P101 setpoint source* = FIELDBUS?

→ proceed with L

H Are all drives connected to the SBus of the gateway accessible from MOVITOOLS® MotionStudio via serial interface X24 of the gateway?

Check SBus addresses and SBus baud rate.

I Is LED H1 on the gateway off?

J Has the Auto Setup function (DIP switch AS) been executed with all drives connected to the SBus and supplied with power?

K In MOVITRAC® B connected to the gateway, is *P100 control source* and *P101 setpoint source* = SBus 1?

L Are the process data words in the drive configured correctly (P870 ... P875)?

M Is process output data enabled (P876) = ON?

N Is the wiring of the binary inputs disabling the operation?

Check parameter group P03_ and P04_.

O Is an error active? What is the state of the unit?

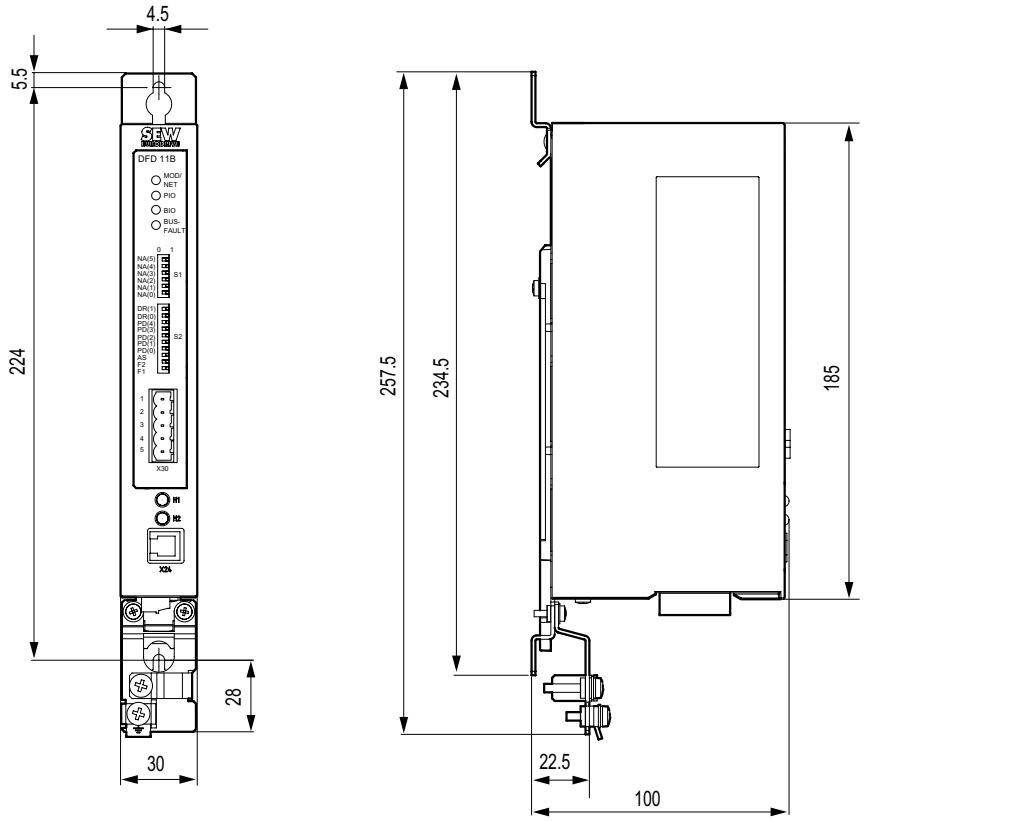
P Is an IPOS$^{plus®}$ program active, which e. g. affects the inverter status?

9 Technical Data

9.1 DFD11B option for MOVIDRIVE® B

DFD11B option	
Part number	824 972 5
Power consumption	P = 3 W
Communication protocol	Master/slave connection set acc. to DeviceNet specification version 2.0
Number of process data words	Adjustable via DIP switches: • 1 ... 10 process data words • 1 ... 4 process data words with Bit-Strobe I/O
Baud rate	125, 250 or 500 kBaud, to be set via DIP switches
Bus cable length	For thick cable according to DeviceNet specification 2.0 Appendix B • 500 m at 125 kBaud • 250 m at 250 kBaud • 100 m at 500 kBaud
Transmission level	ISO 11898 - 24 V
Connection technology	• 3-wire bus and 2-wire supply voltage DC 24 V with 5-pole Phoenix terminal • Pin assignment according to DeviceNet specification
MAC-ID	0 ... 63, can be set using DIP switch Max. 64 stations
Supported services	• Polled I/O • Bit strobe I/O: • Explicit messages
Tools for startup	• MOVITOOLS® software package from version 4.20 • DBG60B keypad
Firmware status of MOVIDRIVE® MDX61B	Firmware status 824 854 0.11 or above (→ display with P076)

9.2 DFD11B option for MOVITRAC® B and Gateway-Housing UOH11B



DFD11B option for MOVITRAC® B and Gateway	
External voltage supply:	V = DC 24 V (–15 %, +20 %) I_{max} = DC 200 mA P_{max} = 3.4 W
Communication protocol	Master/slave connection set acc. to DeviceNet specification version 2.0
Number of process data words	Adjustable via DIP switches: • 1 ... 24 process data words • 1 ... 4 process data words with Bit-Strobe I/O
Baud rate	125, 250 or 500 kBaud, to be set via DIP switches
Bus cable length	For thick cable according to DeviceNet specification 2.0 Appendix B • 500 m at 125 kBaud • 250 m at 250 kBaud • 100 m at 500 kBaud
Transmission level	ISO 11898 - 24 V
Connection technology	• 3-wire bus and 2-wire supply voltage DC 24 V with 5-pole Phoenix terminal • Pin assignment according to DeviceNet specification
MAC-ID	0 ... 63, can be set using DIP switch Max. 64 stations
Supported services	• Polled I/O • Bit strobe I/O: • Explicit messages
Tools for startup	• MOVITOOLS® MotionStudio version 5.40 and higher.
Firmware version of MOVITRAC® B	No special firmware is required

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With drives and controls that automatically improve your productivity.

With comprehensive knowledge in virtually every branch of industry today.

With uncompromising quality that reduces the cost and complexity of daily operations.

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SEW-EURODRIVE GmbH & Co KG
P.O. Box 3023 · D-76642 Bruchsal / Germany
Phone +49 7251 75-0 · Fax +49 7251 75-1970
sew@sew-eurodrive.com

→ **www.sew-eurodrive.com**